植物研究雑誌
J. Jpn. Bot.
78: 269–294 (2003)

A New Circumscription of *Tadehagi* and a New Genus *Akschindlium* (Leguminosae)

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(Received on April 26, 2003)

The genus *Tadehagi* founded by the author in 1973 is revised. It is divided into two genera: *Tadehagi* with a new circumscription and a new genus *Akschindlium* H.Ohashi based on *Tadehagi godefroyanum* (Kuntze) H.Ohashi. Pollen features of three species representing the genera *Tadehagi*, *Akschindlium* and *Droogmansia* are provided. The newly circumscribed *Tadehagi* is divided into two subgenera: Tadehagi and Kerria. A key to these genera and subgenera is provided. *Tadehagi* comprises six species: *T. alatum* (DC.) H.Ohashi, *T. auriculatum* (DC.) H.Ohashi, *T. andamanicum* (Balakr. & N.G.Nair) S.P.Mathew, *T. robustum* Pedley, *T. rodgeri* (Schindl.) H.Ohashi and *T. triquetrum* (L.) H.Ohashi. *Tadehagi triquetrum* varies in the leaf shape and loment hairiness especially in the Lesser Sunda Islands, New Guinea and the Philippines. The species is newly circumscribed as including subsp. *pseudotriquetrum* (DC.) H.Ohashi and a hybrid between subsp. *pseudotriquetrum* (DC.) H.Ohashi and subsp. *triquetrum*, nothosubsp. *philippinensis* H.Ohashi. The hybrid includes a variety, var. *palawanensis* H.Ohashi. *Tadehagi triquetrum* subsp. *triquetrum* is newly recorded in Taiwan. A key to these species, subspecies and hybrids is also provided.

Key words: *Akschindlium*, Desmodieae, *Droogmansia*, Leguminosae, *Tadehagi*.

The genus *Tadehagi* H.Ohashi was established in 1973 based on *Pteroloma* Desv. ex Benth., a later homonym of *Pteroloma* Hochst. & Steud., and a species of *Droogmansia* De Wild. (Ohashi 1973). It included three subgenera, i. e., Tadehagi s. str., Kerria H.Ohashi, and Godefroya (Schindl.) H. Ohashi. *Tadehagi* was, however, recognized as intergrade with *Droogmansia* (Ohashi et al. 1981). This view has been accepted due to the problematical taxonomic position of *Tadehagi godefroyanum* (Kuntze) H. Ohashi, the monotypic representative of the subgenus Godefroya (Fig. 1).

Subgenus Godefroya was founded by Schindler (1924) in the genus *Droogmansia*. It is similar to *Droogmansia* in the stamens, calyx, seeds and bracteoles, but some characters are close to *Tadehagi* such as the smaller flowers, narrowly oblong loments with less constricted sutures, narrowly winged petiole, and pollen morphology.

Pollen grains of Godefroya, *Tadehagi* and *Droogmansia* are fundamentally similar in morphology as well as wall stratification. This overall similarity indicates their close relationship, but the tectum differs between *Droogmansia* and the other two (Ohashi 1971). Godefroya and *Tadehagi* have reticulate to foveolate sculpturing at the mesocolpium with the lumina 0.5–1.5 μm in diameter, while *Droogmansia* has reticulate sculpturing with lumina 1–3 μm in diameter (Figs. 2–4).

In addition to the similarities in macroscopic and pollen characters between Godefroya and *Tadehagi*, Godefroya is found entirely inside the East Asian distribution range of *Tadehagi*. *Droogmansia* is confined to tropical Africa. Therefore it was

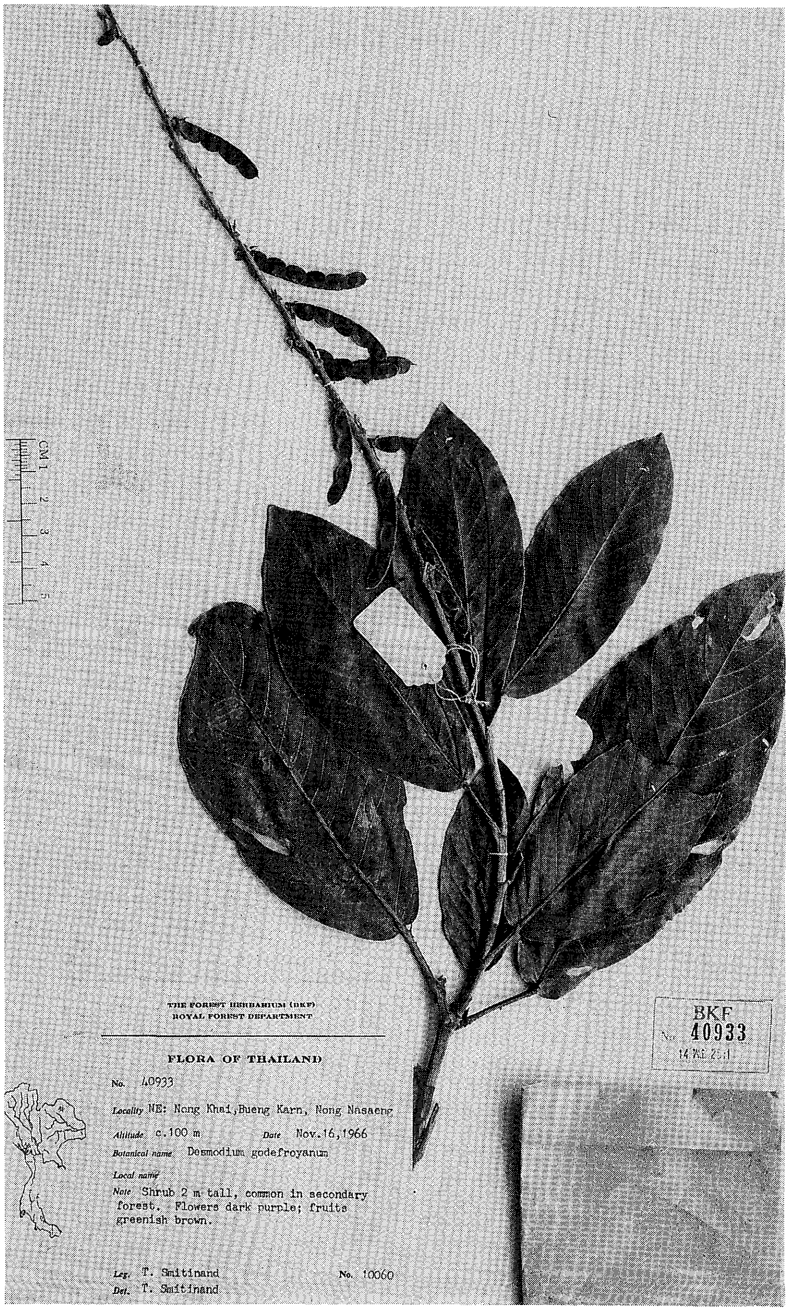
CM 1 2 3 4 5
THE FOREST HERBARIUM (BKF)
ROYAL FOREST DEPARTMENT
FLORA OF THAILAND
No. 40933
Locality NE: Nong Khai, Bueng Karn, Nong Nasaeng
Altitude c. 100 m
Date Nov. 16, 1966
Botanical name Desmodium godefroyanum
Local name
Note Shrub 2 m tall, common in secondary forest. Flowers dark purple; fruits greenish brown.
Leg. T. Smitinand
No. 10060
Det. T. Smitinand
BKF
No. 40933

Fig. 1. *Akschindlium godefroyanum* (Kuntze) H.Ohashi. Thailand. Smitinand 10060 (BKF, cited in Ohashi 1973).

natural to accommodate Godefroya within *Tadehagi* (Ohashi 1973). Reassessment of the morphological and pollen characters as outlined above suggested that Godefroya is apparently intermediate between *Tadehagi* and *Droogmansia*, in spite of the shared distribution of the former two genera. *Tadehagi* and *Droogmansia* are recognized as distinct in results of an analysis of the chloroplast gene rbcL (Bailey et al. 1997, Kajita et al. unpublished), although Godefroya is not yet analyzed. The chromosome numbers are known only in *Tadehagi triquetrum* subsp. *triquetrum* and subsp. *pseudotriquetrum*, i. e., n = 11 and 2n = 22 (cf. Ohashi 1973, Goldblatt and Johnson 1991, 1998). Although knowledge of these taxa are insufficient at the moment, I would favour recognition of the subgenus Godefroya as an independent genus distinct from *Tadehagi* and *Droogmansia* for stability of the system of tribe Desmodieae. To combine these three taxa into one genus would be a revival of the wider concept of *Desmodium* proposed by Bentham (1865) that is inconsistent in its boundary with *Uraria*, *Christia*, or *Alysicarpus*. I will discuss the problems in generic circumscription in the tribe Desmodieae in a precursory treatment for *Desmodium* and its allied genera in Malesia (Ohashi in preparation).

The new generic name for Godefroya, *Akschindlium* H.Ohashi, is proposed here in honor of Dr. Anton Karl Schindler (1879–1964) who founded subgenus Godefroya in *Droogmansia* and, also, made great contributions to the taxonomy of the tribe Desmodieae in Leguminosae (see Schubert 1964, Pedley 1999).

The tribe Desmodieae is most diverse in the Sino-Indian region (Ohashi et al. 1981). *Desmodium* and its related genera are considered to have undergone their primary radiation in SE. Asia because more high level taxa (genera, subgenera and sections) of *Desmodium* and allies occur in this area than in any other part of the world (Ohashi 1973, 1992). The genus *Dendrolobium* is considered to be most primitive genus among *Desmodium* and its related genera and *Tadehagi*, in the older sense including Godefroya, was supposed to be derived from *Dendrolobium* (Ohashi 1973). *Dendrolobium* is most abundant in Indochina with several endemic species. *Akschindlium* and *Tadehagi* subgenus Kerria are distributed in similar areas; the former is restricted to Thailand and Indochina (Cambodia, Laos and Vietnam), and the latter Myanmar, Thailand and Indochina (Laos). Subgenus Tadehagi is widely distributed in SE. and E. Asia and N. Australia, while *Droogmansia* is endemic to tropical Africa. It may be supposed that *Akschindlium* and *Tadehagi* subgenus Kerria originated in Indochina from a species of *Dendrolobium* and that *Akschindlium* might be phylogenetically distinct from *Droogmansia.*

This work had been prepared mainly by studying herbarium specimens of *Tadehagi* and its related genera kept in A & GH, BKF, BO, CAL, K, KYO, L, LAE, NY, PNH, TI, TUS, and US. Studies on the species from Thailand (Ohashi 1982), Indo-China (Dy Phon et al. 1994) and Malesia (Ohashi in prep.) were especially helpful for this revision. Field observations were made in Australia, China, the Philippines and Taiwan. Results of pollen morphology described in this paper were provided by Ye. Pollen materials were obtained from herbarium specimens. Methods used for pollen examination and terminology for pollen descriptions in this study are the same as those used in Ye and Ohashi (2002).

Pollen morphology

Pollen grains of *Akschindlium*, *Droogmansia*, and *Tadehagi* were first described by Ohashi (1971, 1973) using light microscopy. Descriptions and figures are provided here from results obtained by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). SEM and TEM pollen features in these genera were first shown in *Droogmansia scaettaiana* by Ferguson and Skvarla (1981).

General features of pollen grains of *Akschindlium*, *Droogmansia*, and *Tadehagi* (Figs. 2–4): The pollen grains are tricolporate; colpi 0.8–0.9 times and endoaperture 0.2–0.3 times the length of polar axis; exine

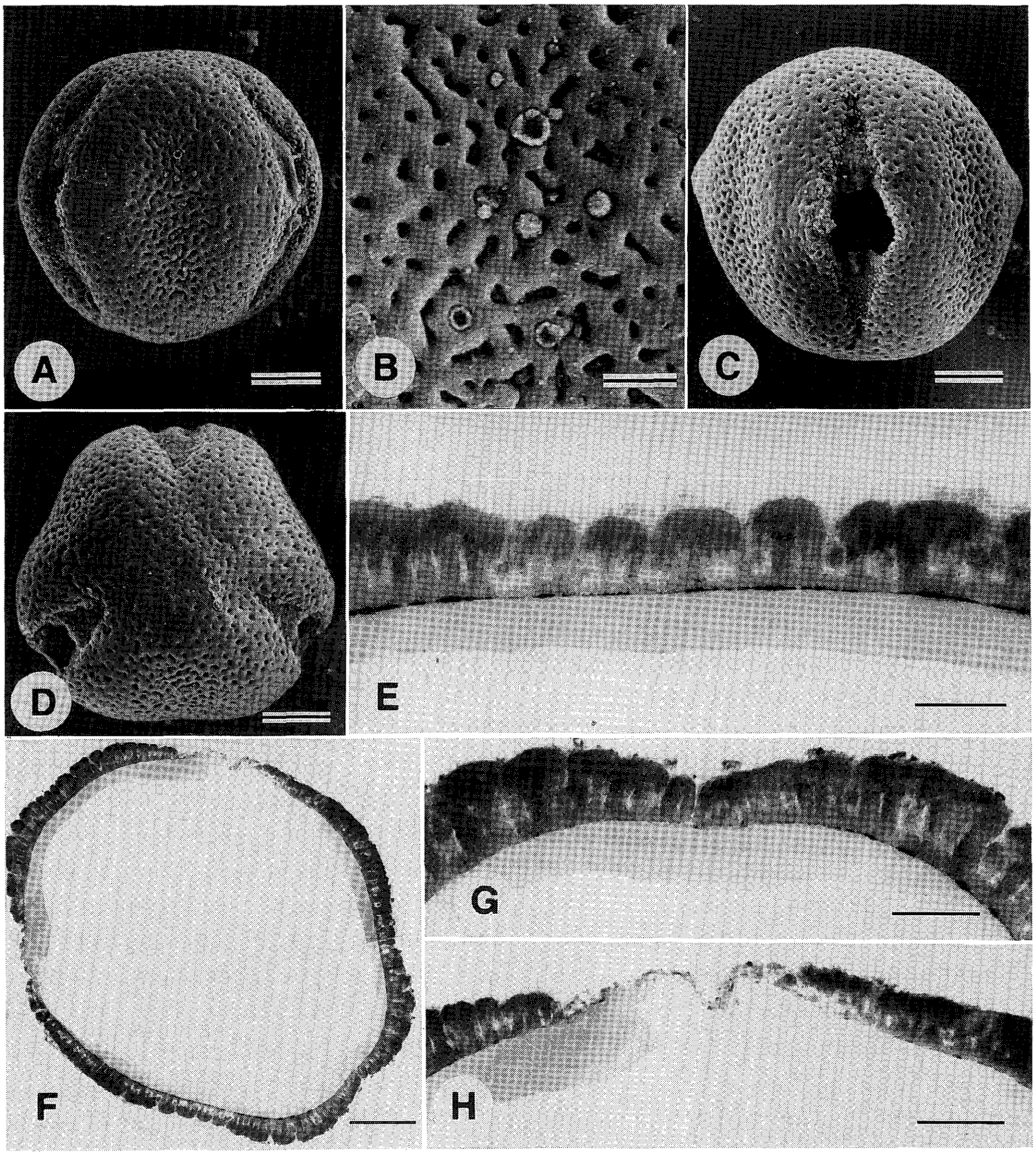

Fig. 2. Pollen morphology of *Akschindlium godefroyanum* (Schindl.) H.Ohashi. A: Equatorial view. B: Tectum at mesocolpium. C: Equatorial view. D: Polar view. E: Cross section at mesocolpium. F: Cross section. G, H: Cross sections at aperture. Scale bars: A, C, D, F = 5 μm, B, E, G, H = 1 μm. Voucher specimen: G. Murata & al. T-37621 (TUS).

0.8–1.5 µm thick at mesocolpium; tectum, infratectum with foot layer and endexine almost equal in thickness, each about 1/3 of the exine; columellae regular; foot-layer continuous.

Akschindlium godefroyanum (Kuntze) H.Ohashi (Fig. 2): Pollen grains tricolporate, (20.8–)22.5(–25.6) µm in polar axis, (21.3–) 22.9(–25.0) µm in equatorial diameter; P/E = (0.91–) 0.98 (–1.05), oblate spheroidal to prolate spheroidal; colpi broad, ca. 4 µm wide at equator, tapering to pointed ends, colpus membrane almost smooth, occasion-

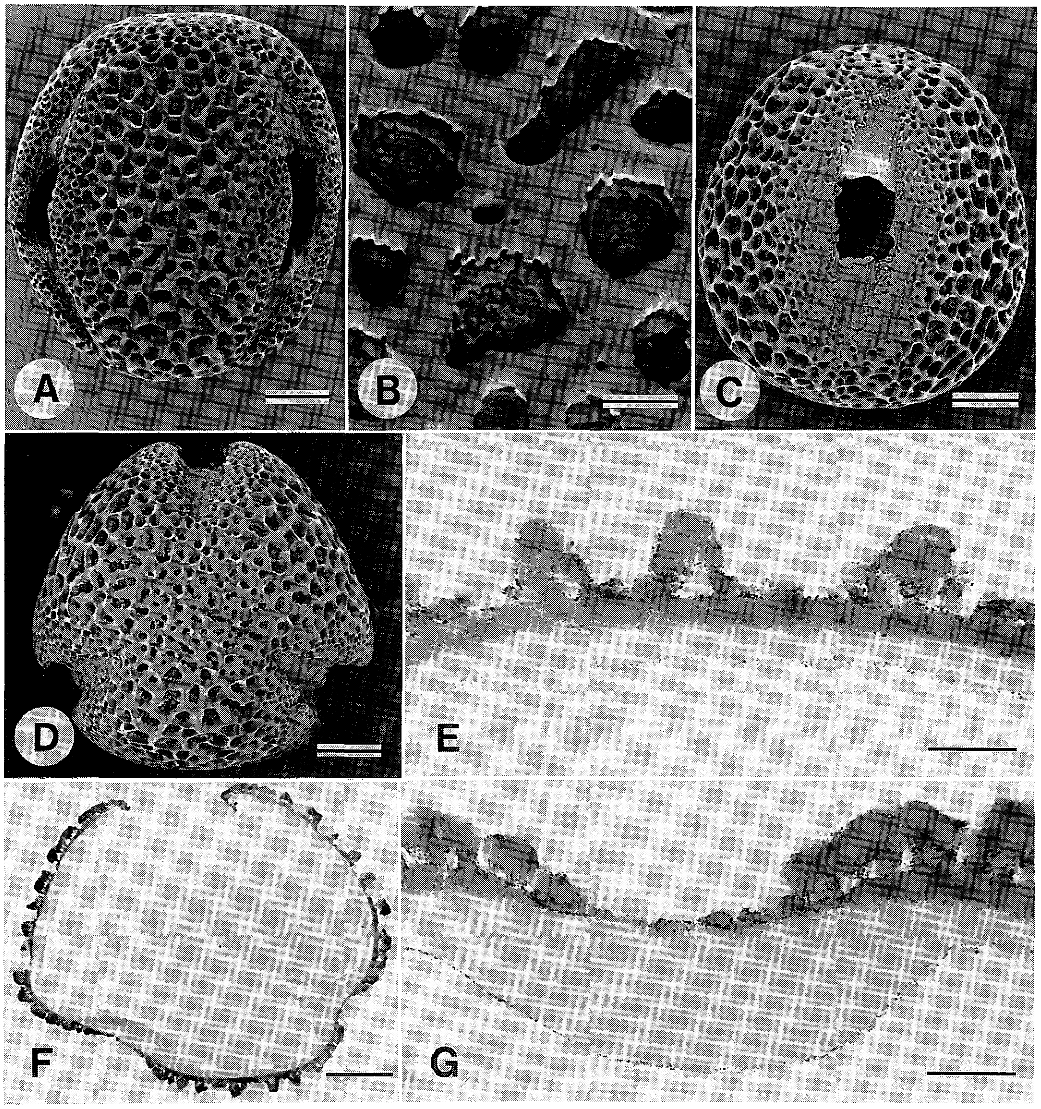

Fig. 3. Pollen morphology of *Droogmansia pteropus* (Baker) De Wild. A: Equatorial view. B: Tectum at mesocolpium. C: Equatorial view. D: Polar view. E: Cross section at mesocolpium. F: Cross section. G: Cross section at aperture. Scale bars: A, C, D, F = 5 µm, B, E, G, H = 1 µm. Voucher specimen: Stolz 2384 (A).

ally with fine granules, margins almost undifferentiated from mesocolpium; sexine tectate; sculpture at mesocolpium reticulate to foveolate, occasionally with perforate, lumina 0.5–1.2 μm in diameter. Exine ca. 1.5 μm thick in mesocolpium, sexine about as thick as nexine; tectum discontinuous, about 1/3–1/4 times the thick of exine; infratectum well defined, as thick as tectum, consisting of regular columellae; foot-layer continuous, less than 1/2 the thickness of infratectum, consistent; endexine well developed, about 1/3 the thickness of exine, gradually thickening toward colpi.

Voucher specimen: Thailand. E; Surin Prov. G. Murata & al. T-37621 (TUS).

Droogmansia pteropus (Baker) De Wild. (Fig. 3): Pollen grains tricolporate, (21.6–) 25.3(–27.1) μm in polar axis, (19.5–)21.7 (–23.2) μm in equatorial diameter; P/E = (1.08–)1.17(–1.27), prolate spheroidal to subprolate; colpi broad, ca. 4 μm wide at equator, tapering to rounded ends, colpus membrane almost smooth, occasionally with fine granules, margins with a punctate; sexine semi-tectate; sculpture at mesocolpium reticulate, lumina 1–3 μm in diameter, with columellae elements. Exine ca. 1.5 μm thick in mesocolpium, sexine slightly thicker than nexine; tectum discontinuous, about 1/3 the thickness of exine; infratectum about 1/2 the thickness of tectum thickness, consisting

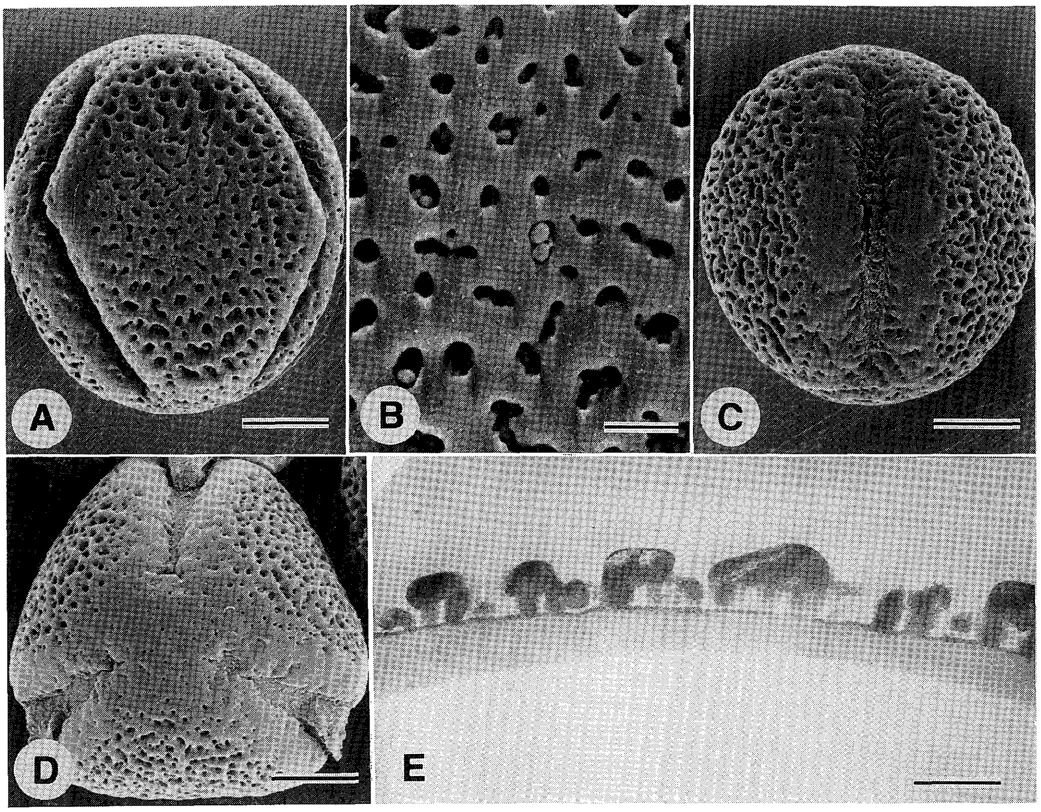

Fig. 4. Pollen morphology of *Tadehagi triquetrum* (L.) H.Ohashi subsp. *triquetrum*. A: Equatorial view. B: Tectum at mesocolpium. C: Equatorial view. D: Polar view. E: Cross section at mesocolpium. Scale bars: A, C, D = 5 μm, B, E = 1 μm. Voucher specimen: Y. Endo 2 Dec. 1981 (TUS).

of columellae; foot-layer continuous, same thickness as columellae, consistent; endexine developed, about 1/4 the thickness of exine, gradually thickening toward colpi.

Voucher specimen: Kyimbila. Stolz 2384 (A).

Tadehagi triquetrum (L.) H.Ohashi subsp. *triquetrum* (Fig. 4): Pollen grains tricolporate, (16.9–) 20.1 (–24.0) μm in polar axis, (13.3–)17.2(–24.4) μm in equatorial diameter; P/E = (0.94–) 1.19 (–1.72), oblate spheroidal, prolate spheroidal, subprolate prolate; colpi narrow, ca. 1 μm wide at equator, tapering slightly to rounded ends, colpus membrane with fine granules, margins with a complete tectum; sexine tectate; sculpture at mesocolpium reticulate to foveolate, occasionally with perforate, lumina 0.8–1.5 μm in diameter. Exine 1–1.5 μm thick in mesocolpium, sexine thicker than nexine; tectum discontinuous, about 1/3 the thickness of exine; infratectum well defined thickness same as tectum, consisting of regular columellae; foot-layer continuous, less than 1/3 the thickness of infratectum; endexine well developed, about 1/3 the thickness of exine.

Voucher specimen: Cultivated in Tohoku University, Sendai. Originally seeds from Hongkong. Y. Endo 2 Dec. 1981 (TUS).

Taxonomic treatment

Key to *Akschindlium*, *Droogmansia* and *Tadehagi* with its subgenera:

1. Free parts of filaments dimorphic, alternately expanded or filiform; bracteoles absent; upper (= adaxial) calyx-lobes longer than lateral and lowest lobes; seeds slightly or scarcely rim-arillate around the hilum 2
    2. Free parts of filaments narrowly obcordate, not overlapping each other. Wings smaller than the keels. Loments usually long stalked; articles as long as or longer than broad. Stipules free, persistent. Endemic to tropical Africa.......... .... *Droogmansia*
    2. Free parts of filaments elliptic, imbricate. Wings larger than the keels. Loments short stalked; articles longer than broad. Stipules connate into a bifid scale, early deciduous. Endemic to Thailand and Indo-China .... *Akschindlium*
1. Free parts of filaments uniform, filiform; stipules free, bracteoles present; lowest (= abaxial) calyx-lobes longer than upper and lateral lobes; seeds rim-arillate around the hilum .... *Tadehagi*
    2. Wings almost equal to the keel-petals in size and both petals not arcuate; pods long-stiped (the stipe more than 8 mm long), distinctly constricted along the lower margin; petiolar wings inconspicuous. Endemic to Myanmar, Thailand and Laos .... subgen. Kerria
    2. Wings distinctly longer than the keel-petals and both petals apparently arcuate; pods shortly stiped (the stipe less than 7 mm long), shallowly constricted along the lower margin; petiolar wings conspicuous. Tropical Asia, N. Australia and Pacific .... subgen. Tadehagi

1. **Akschindlium** H.Ohashi, gen. nov.

Droogmansia subgen. Godefroya Schindl. in Repert. Spec. Nov. Regni Veg. **20**: 274 (1924) [Type species: *Droogmansia godefroyana* (Kuntze) Schindl. (= *Meibomia godefroyana* Kuntze)].

Tadehagi subgen. Godefroya (Schindl.) H.Ohashi in Ginkgoana **1**: 284, t. 44a (1973).

Meibomia auct. non Heist. ex Fabr.: Gagnep. in Fl. Indo-Chine **2**: 608 (1920), ut "*Meibomia* Adanson".

Frutex, erectus, ramosus; rami teretes; folia stipulata, petiolata, 1-foliolata, 2-stipellata; petiolo alato; stipulae connatae, bifidae, caducae; inflorescentiae terminales et axillares, racemosae; flores in bractearum axillis, 2–5 in quoque fasciculo, pedicellati; bracteae primariae et secundariae praesentes; bracteolae nullae; calyx late campanulatus, 4-fidus, lobus posticus magnissimus; vexillum orbiculare vel perlate obovatae, exauriculatum; alae carinam superantae; stamina monadelpha, vexillari 2/3 longitudinis cum ceteris connato, libero ad apicem et basim, filamentis connati libero ad apiceum, filamentorum dilatatorum partes liberae latae, ovatae et ellipticae, imbricatae; ovarium breviter stipitatum; disco tubuliformi circumcinctum; stigma terminale; legumen stipitatum, compressum, angusto-oblongum, articulatum; semina rim-arillata.

Shrub, erect, usually 1.5–3 m high; branches terete. Leaves 1-foliolate. Petioles winged. Stipules connate at the opposite side of the petioles, bifid at apex, early deciduous, leaving a transversely long scar on the branch. Inflorescences pseudoracemose, terminal and axillary. Flowers in 2–5-flowered fascicles. Primary and secondary bracts present. Bracteole absent. Calyx broadly campanulate, 4-lobed; upper lobe larger than other lobes. Standard orbicular or very broadly obovate, not auriculate; wings larger than the keel-petals. Stamens monadelphous, vexillary one free at the apex and base and connate with the others below two thirds of its length; connate stamens free at the apex, free part of the filaments much dilated, overlapping each other, membranous, elliptic. Ovary shortly stiped. Disk distinct around the base of ovary. Loments shortly stiped, compressed, straight, narrowly oblong; articles quadrate to transversely oblong, reticulate-veined. Seeds scarcely rim-arillate around the hilum.

Type species: *Akschindlium godefroyanum* (Kuntze) H.Ohashi (= *Meibomia godefroyana* Kuntze).

1-1. **Akschindlium godefroyanum** (Kuntze) H.Ohashi, comb. nov. (Fig. 1).

Meibomia godefroyana Kuntze, Rev. Gen. **1**: 196 (1891) [Type: Cambodia. Godefroy s.n. July 1875. (P holo., iso., n. v.)]; Gagnep. in Lecomte, Fl. Indo-Chine **2**: 608, fig. 56 (1920).

Droogmansia godefroyana (Kuntze) Schindl. in Repert. Spec. Nov. Regni Veg. **20**: 274 (1924), in Repert. Spec. Nov. Regni Veg. Beih. **49**: 310 (1928); Thuan, Fl. Camb. Laos Vietn. **23**: 126, t. 21 (1987); Lock & Heald, Leg. Indo-China Check-List: 75 (1994).

Desmodium godefroyanum (Kuntze) Craib, Fl. Siam. Enum. **1**: 407 (1928); Merr. in Brittonia **2**: 193 (1936).

Tadehagi godefroyanum (Kuntze) H.Ohashi in Ginkgoana **1**: 284, pl. 44a, figs. 81–83 (1973); Dy Phon in Dy Phon et al., Fl. Camb. Laos Vietn. **27**: 48 (1994).

Distr.: Thailand and Indo-China (Cambodia, Laos, and Vietnam).

Specimens. examined. (addition to Ohashi 1973): **Thailand**. Surin. G. Murata et al. T-37621 (KYO, TUS). **Cambodia**. Mout Kulen. Martin 1275 (P, TUS). **Laos**. Vientiane. Hayata 8 Dec. 1921 (TI, TUS); Dan Si. Iwatsuki et al. 1043 (TUS); Mt. Phu Kao Kwai. Iwatsuki et al. 1012 (TUS); Se Ban Fai. Poilane 28277 (P, TUS).

The stamen of *Akschindlium godefroyanum* is monadelphous, but its vexillary stamen is free at the very base and has small openings (fenestrae). It has a disk around the base of ovary. These features in the structure of flowers indicate that the genus is adapted to bee pollination.

2. **Tadehagi** H.Ohashi, Ginkgoana **1**: 280 (1973), p. p., excl. subgen. Godefroya [Type: *T. triquetrum* (L.) H.Ohashi (= *Hedysarum triquetrum* L.)]; H.Ohashi & al., Adv. Leg. Syst. **1**: 299 (1981); Huang & H.Ohashi, Fl. Taiwan ed. 2, **3**: 350 (1993); Dy Phon in Dy Phon et al., Fl. Camb. Laos Vietn. **27**: 47 (1994); Yang & Huang in Fl. Reipub. Popul. Sin. **41**: 62 (1995); Pedley, Rev. Hand. Fl. Ceylon **10**:168 (1996); H.Ohashi in Sci. Rep. Tohoku Univ. ser. 4, Biol. **40**: 249 (1999); Pedley in Austrobaileya **5**: 258 (1999).

Desmodium sect. Pleurolobium DC. [unranked] Pteropoda DC., Prodr. **2**: 326 (1825) [Type species (here designated): *Desmodium* *triquetrum* (L.) DC.] & Mém. Lég. 317 (1826). Ohashi (1973) regarded Pteropoda DC. at the subsection rank.

Pteroloma Desv. ex Benth. in Miq., Pl. Jungh. 217, in adnota, & 219 (1852) [Type species: *P. triquetrum* (L.) Desv. ex Benth. (= *Hedysarum triquetrum* L.)], non *Pteroloma* Hochst. & Steud. (1841); Schindl. in Repert. Spec. Nov. Regni Veg. **20**: 271 (1924), in Repert. Spec. Nov. Regni Veg. Beih. **49**: 362 (1928); Hutch., Gen. Fl. Pl. **1**: 484 (1964), ut "*Pteroloma* DC."; Allen & Allen, Leguminosae: 568 (1981).

Desmodium sect. Pteroloma (Desv. ex Benth.) Benth. in Benth. & Hook.f., Gen. Pl. **1**: 519 (1865); Merr. in Philipp. J. Sci., C. **5**: 86 (1910).

Desmodium subgen. Pteroloma (Desv. ex Benth.) Baker in Hook.f., Fl. Brit. Ind. **2**: 163 (1876).

Meibomia Adanson (1763) sensu Gagnep. in Lecomte, Fl. Indo-Chine **2**: 608 (1920).

Subshrubs or shrubs. Leaves 1-foliolate. Stipules free. Petioles winged. Stipels 2, connate with the petiolar wings. Inflorescences pseudoracemose, terminal or axillary, usually 2–6-flowered at a node. Primary bracts bearing 2 secondary bracts; secondary bracts bearing flowers at the axil. Bracteoles present. Calyx campanulate, 4-lobed; upper lobe reflexed, broadly ovate-triangular, entire or minutely 2-toothed at the apex, lowest lobe longer than other lobes.

Petals with well developed nerves; standard clawed, reflexed at the top of the claw, blade orbicular to transversely broadly elliptic or obovate; wings elliptic oblong, not shorter than the keel-petals. Stamens 10, monadelphous, vexillary stamen free at the apex, connate to others two thirds of its length. Disks present. Ovary stipitate, 5–8-ovuled; style glabrous; stigma capitate.

Loments stipitate, straight or slightly incurved, compressed, narrowly oblong, usually 5–8 jointed, upper sutures nearly straight or slightly undulate, lower sutures shallowly to deeply constricted. Seeds transversely broadly to transversely elliptic, rim-arillate, concave at the hilum.

2-1. *Tadehagi* subgen. **Kerria** H.Ohashi in Ginkgoana **1**: 287 (1973) [Type species: *T. kerrii* (Schindl.) H.Ohashi (= *Pteroloma kerrii* Schindl.)].

2-1-1. **Tadehagi rodgeri** (Schindl.) H.Ohashi in J. Jpn. Bot. **57**: 266, fig. 1 (1982). (Fig. 5)

Pteroloma rodgeri Schindl. in Repert. Spec. Nov. Regni Veg. **20**: 272 (1924) [Type: Burma (Myanmar). Ruby Mines, Mogok. A. Rodger 196 (K holo., CAL iso.)].

Pteroloma kerrii Schindl. in Repert. Spec. Nov. Regni Veg. **23**: 361 (1927) [Type: Thailand. Me Ping Rapids, Keng Soi, alt. ca. 400 m. F. Kerr 4634 (K holo.)].

Desmodium kerrii (Schindl.) Craib, Fl. Siam. Enum. **1**: 410 (1928).

Pteroloma triquetrum subsp. *rodgeri* (Schindl.) H.Ohashi in J. Jpn. Bot. **41**: 96 (1966).

Tadehagi triquetrum (L.) H.Ohashi subsp. *rodgeri* (Schindl.) H.Ohashi in Ginkgoana **1**: 295 (1973); Dy Phon in Dy Phon & al., Fl. Camb. Laos Vietn. **27**: 54, pl. 11: 6–10 (1994).

Tadehagi kerrii (Schindl.) H.Ohashi in Ginkgoana **1**: 287, pl. 43 (1973).

Distr.: Myanmar, Thailand and Laos.

Specimens examined (excl. cit. in Ohashi 1973, 1982). **Myanmar**. Ruby Mines District: Mogok, Shweli Valley. A. Rodger 196 (K holo. of *Pteroloma rodgeri* Schindl., CAL iso. The type in CAL is isotype, not as in Ohashi 1973). **Thailand**. Me Ping Rapids, Keng Soi, alt. ca. 400 m. F. Kerr 4634 (K holo. of *Pteroloma kerrii* Schindl.); loc. cit. Kerr 4641 (BK, not the type, not as in Ohashi 1973); C.F. van Beusekom & Phengklai 2569 (L); Prov. E., Chaiyaphum. Nam Pham. 16°20′N 101°45′E, alt. 600 m. C. F. van Beusekom & al. 4138 (KYO).

2-2. *Tadehagi* subgen. **Tadehagi**: H. Ohashi in Ginkgoana **1**: 290 (1973) [Type species: *T. triquetrum* (L.) H.Ohashi (= *Hedysarum triquetrum* L.)].

Key to the species of subgenus Tadehagi:

1. Loments distinctly stiped, exserted from the calyx; stipe 3–7 mm long 2

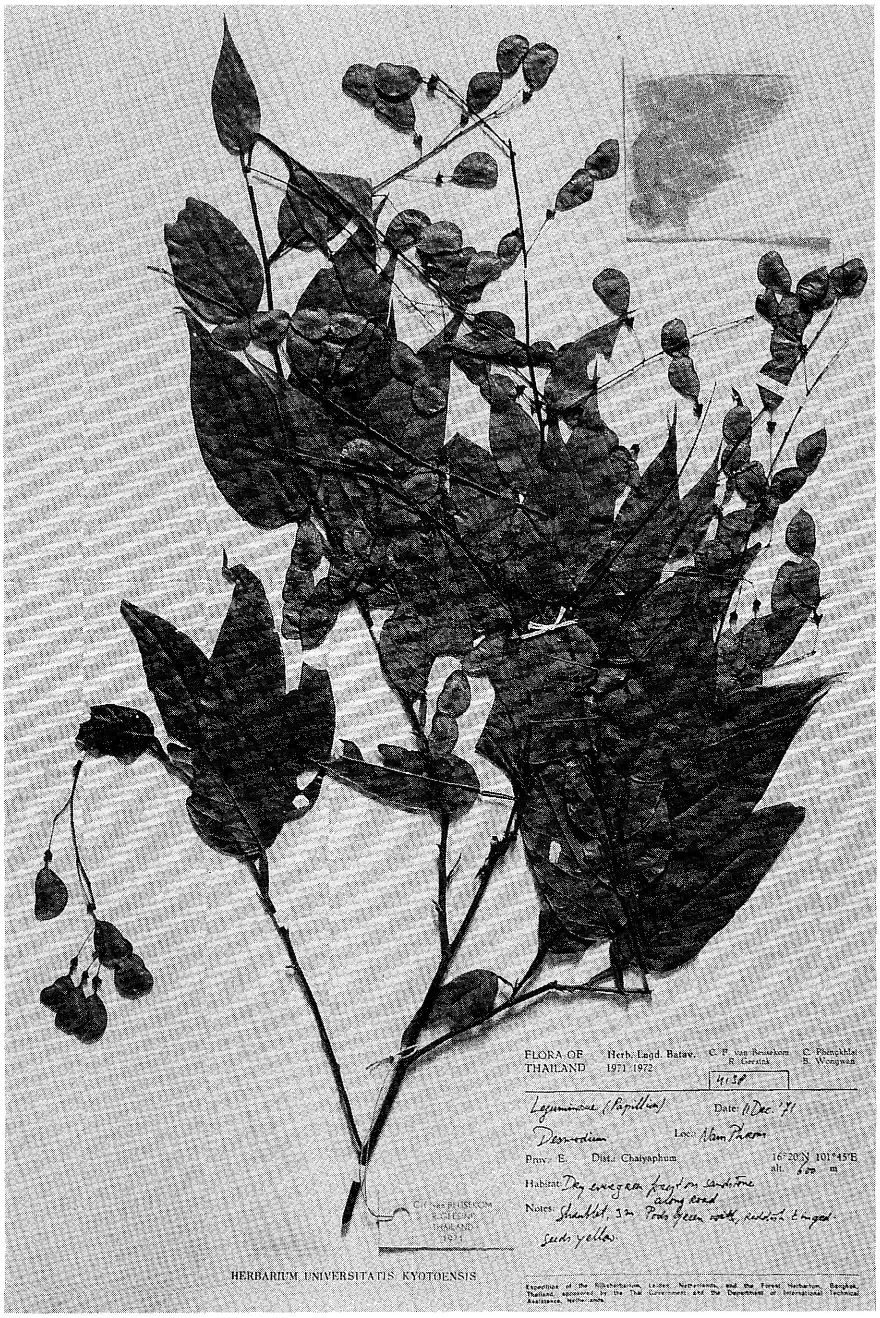
FLORA OF THAILAND
Herb. Lugd. Batav. 1971–1972
C. F. van Beusekom R. Geesink
C. Phengkhlai B. Wongwan
4138
Leguminosae (Papillion.)
Date: 11 Dec. '71
Desmodium
Loc.: Nam Pham
Prov.: E.
Dist.: Chaiyaphum
16°20'N 101°45'E
alt. 600 m
Habitat: Dry evergreen forest on sandstone along road
Notes: Shrublet, 3 m. Pods green with reddish tinged. Seeds yellow.
HERBARIUM UNIVERSITATIS KYOTOENSIS

Fig. 5. *Tadehagi rodgeri* (Schindl.) H.Ohashi. Thailand. Prov. E., Chaiyaphum. Nam Pham. C. F. van Beusekom & al. 4138 (KYO).

2. Loments 2-seeded, lateral surfaces puberulent; articles 13–16 mm long........ ....*T. andamanicum*
2. Loments more than 4-jointed, lateral surfaces glabrous or glabrescent; articles less than 10 mm long............................3
    3. Pericarp thinly chartaceous, margins pubescent; articles broadly oblong, 6–9 mm long, 7–12 mm wide.......*T. alatum*
    3. Pericarp corky, margins glabrescent, stipes 3–4 mm long; articles almost quadrangular, 5–7 mm long and wide... ....*T. auriculatum*

1. Loments shortly stiped, not or scarcely exserted from the calyx; stipe 1–3 mm long; articles in middle part less than 5 mm long..4
    4. Loments 4–5-jointed, sparsely hairy on sutures; articles ca. 5 mm long, 8 mm wide; leaflet-blade less than 3 times longer than broad, oblong or ovate.................................*T. robustum*
    4. Loments 5–8-jointed, densely hairy on sutures; articles 2.5–3.5 mm long, 5–6 mm wide; leaflet-blade usually more than 3 times longer than broad, linear to narrowly oblong-ovate or narrowly ovate.....................*T. triquetrum*

2-2-1. **Tadehagi alatum** (DC.) H.Ohashi, stat. nov. (Fig. 6).

Desmodium alatum DC., Prodr. **2**: 326 (1825) [Type: India orient. ad Cawnpore (G holo., n. v.); in Candolle: Prodromi Herbarium, IDC micro-edition (TUS)] & Mém. Lég.: 321 (1826).

Desmodium triquetrum (L.) DC. subsp. *alatum* (DC.) Prain in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. **66**: 390 (1897); Meeuwen in Reinwardtia **6**: 263 (1962); Sanjappa, Leg. Ind. 164 (1992).

Pteroloma pseudotriquetrum × *alatum*: Schindl. in Repert. Sp. Nov. **20**: 272 (1924). [Voucher specimen: India. Bengal. Regio tropica. Hooker f. & Thomson (K, GH)].

Pteroloma triquetrum (L.) Desv. ex Benth. subsp. *alatum* (DC.) H.Ohashi in J. Jpn. Bot. **41**: 95 (1966).

Tadehagi triquetrum subsp. *alatum* (DC.) H.Ohashi in Ginkgoana **1**: 292, t. 41a (1973).

Shrub. Leaves 1-foliolate. Stipules narrowly ovate, 1.5–2 cm long, 3–5 mm wide, acuminate, glabrous, conspicuously striate. Petioles 1–3 cm long, winged, sparsely appressed pubescent; wings 2–4 mm wide at broadest part, almost glabrous; joined with stipel at tip; stipel curved, glabrous. Leaflet-blade narrowly ovate or narrowly elliptic, 7–15.5 cm long, 1.5–3 cm wide, acuminate at apex, obtuse to rounded or sometimes slightly cordate at base, both surfaces sparsely appressed pubescent on midrib, sparsely appressed ciliate along margin, seemingly glabrous but minute hairy in other parts, lateral nerves alternate, 14–18 pairs, looped within margin.

Inflorescences pseudoracemose, to 40 cm long, 2–6 flowers per node, rachis sparsely appressed pubescent, with patent minute hooked hairs. Primary bracts narrowly ovate or narrowly triangular, 3–5 mm long, ca. 0.7 mm wide, striate, ciliate; secondary bracts subulate, 1–2 mm long. Pedicels 5–7 mm long, covered sparsely to uniformly with patent minute hooked hairs. Bracteoles subulate, 1–1.5 mm long. Calyx appressed pubescent and minute hooked hairy; lateral lobes triangular, 1–1.5 mm long; the lowest lobe narrowly triangular, 3.5–4 mm long. Corolla pink to purplish red; standard incurved, wings 5–6 mm long, as long as the keel, long clawed (claw ca. 2 mm long), keel distinctly auriculate, long clawed (claw ca. 2 mm long). Ovary densely pubescent along both margins, minutely stipitate.

Loments 6–7-jointed, dark red in young and brown in mature, stipitate (stipe 3–7 mm long), glabrous on lateral surfaces, densely to sparsely appressed or patent minute puberulent along both sutures, reticulate on lateral surfaces, pericarp thinly chartaceous; articles broadly oblong, 6–9 mm long, 7–12 mm

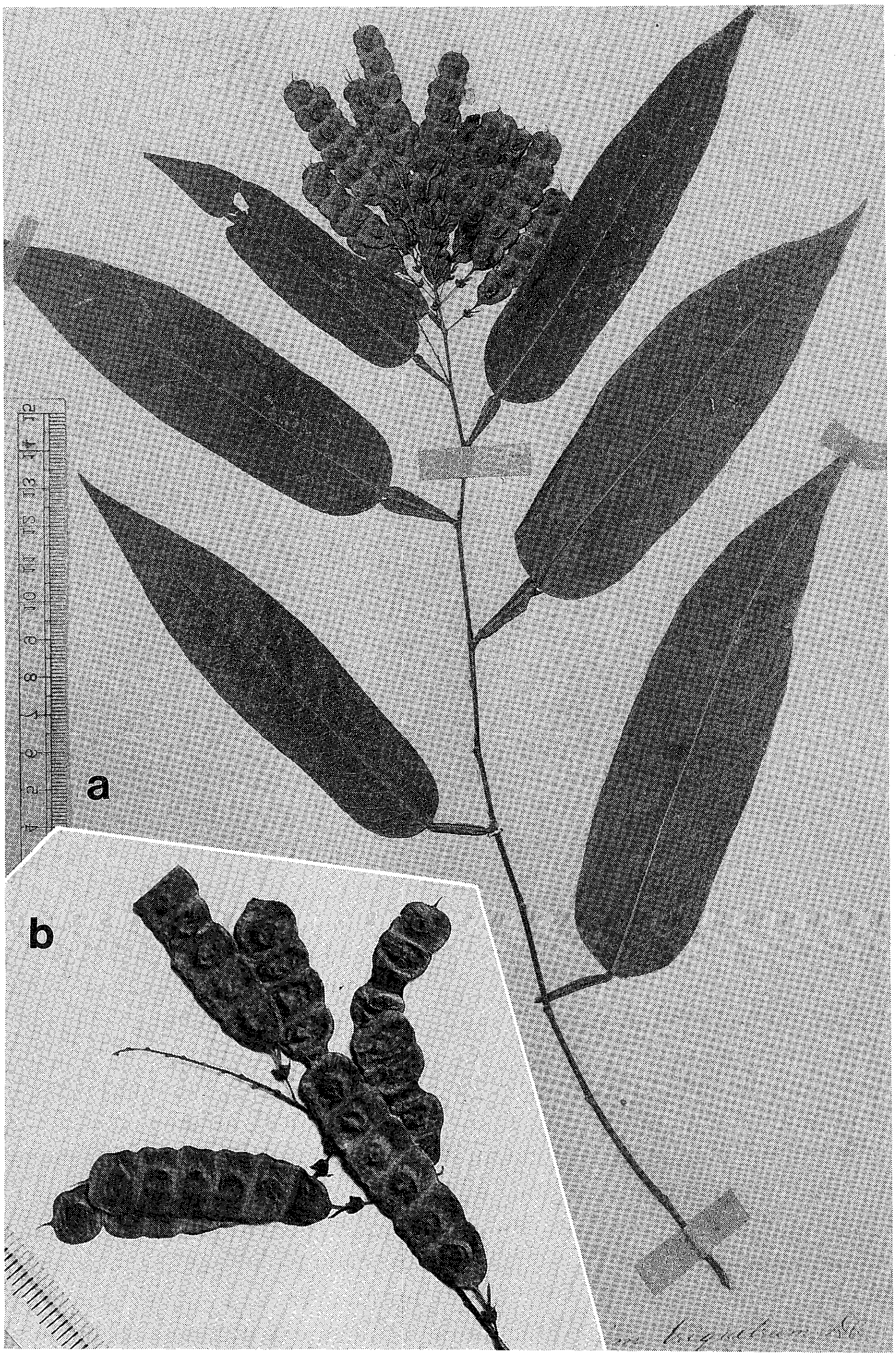

Fig. 6. *Tadehagi alatum* (DC.) H.Ohashi. a: Bangladesh. Chittagong. Rich soil Ihandachery Hill 40 miles from Chittagong. Dr. King's collector Badul Khan 207 (CAL, cited in Ohashi 1973), b. Loments. Java. unknown collector, Communicat. ex Herb. Lugd.-Bat. (GH).

wide.

Distr.: East India (Assam) and Bangladesh (Chittagong).

Specimens examined (excl. specim. cited in Ohashi 1973). **India**. Bengal, Regio trop. Hooker & Thomson (GH, L); Assam. Khasia. regio trop. (K); Khasia. C. B. Clarke 14469C (K), C. B. Clarke 14476A (K), Monsto. 3000 ft. C. B. Clarke 14480A (K); Khasia. N. Cachar Hills, at foot of landslide in full afternoon sunshine, ground firly damp, alt. 600 ft. Flwrs pink; dark red seed pods; lves light grey-green. Nov. 1971. Yandell 50 (K, L). **Bangladesh**. Chittagong, Chundragona. 12 Jan. 1869. C. B. Clarke 8293 (K), Bindralun. 29 Feb. 1868. C. B. Clarke 6579 (K). Chittagong Hill. Lister in 1876 (L); Kaptai, Chittagong Hill Tracts. Shrub 4 ft. high. Fls reddish. Parkinson 4284 (A, GH); 5 km N. of Teknaf. van der Maesen 3767 (K). **Jawa** (cultivated). Beitenzorg. Erik Nyman (UPS); Ex Hort. Bogorensis, Teysmann 1860 (A, BO, K, L); Cult. in Hort. Bog. Halliez in anno 1893 (BO); unknown collector, Communicat. ex Herb. Lugd.-Bat. (GH, K, L). **Madagascar** (introduced). Ch. D'Alleizette Nov. 1906 (L).

Schindler (1924) regarded many specimens of a collection by Hooker f. and Thomson in tropical Bengal as a hybrid between *Pteroloma alatum* and *P. pseudotriquetrum*, because their mature loments were sterile. Specimens of the collection I have so far examined are, however, referable to *Tadehagi alatum* in having a distinct stipe of the loment, long pedicels, long narrow leaflets (the blade 14–16.5 cm long and 3–4 cm wide), and glabrous but ciliate pods. *Tadehagi alatum* always has ciliate pods, although it was characterized by Prain (1897) as glabrous throughout. The hairiness on the loments in *T. alatum* shows the same pattern as *T. triquetrum* subsp. *pseudotriquetrum*. Schindler's presumed hybrid, therefore, apparently belongs to *T. alatum*.

2-2-2. **Tadehagi andamanicum** (Balakr. & N.G.Nair) S.P.Mathew in J. Econ. Tax. Bot. **14**: 236 (1990).

Tadehagi triquetrum subsp. *andamanicum* Balakr. & N.G.Nair in Bull. Bot. Surv. India **24**: 29, fig. 1 (1983) [Type: North Andamans. Saddle Peak, 650–720 m above m.s.l., scrub forests on open hill slopes. 2 Dec. 1976. Balakrishnan & Nair 4798A (CAL holo., n. v.)].

Erect shrub, 1–2 m high. Leaflet-blades oblong-elliptic, 2.5–7 cm long, 1–3.5 cm wide. Pods stalked, 2-seeded, 2.8–3.5 cm long; articles 13–16 mm long, 9–10 mm wide, puberulous, finely reticulate.

Distr.: India. North Andaman Island.

This is an insufficiently known species. I was unable to examine specimens of the species. *Tadehagi triquetrum* subsp. *andamanicum* Balakr. & N.G.Nair was characterized in having 2-seeded pods of which the articles are longer, 13–16 mm long, than those in other taxa (Balakrishnan and Nair 1982). The subspecies appears to belong to the subgenus Tadehagi and close to *T. auriculatum* in floral characters. Sanjappa (1992) regarded it as identical with *Desmodium triquetrum* subsp. *auriculatum* (DC.) Prain, but the loments and leaflet-blades differ from the latter. Judging from the description and the figure by Balakrishnan and Nair (1982), the leaves are similar to those of *Tadehagi triquetrum* subsp. *pseudotriquetrum* and the pods are unique in the genus. The loment illustrated in Balakrishnan and Nair's Fig. 1 (1982) has a distinct stalk which is exserted from the calyx and seems to be more than 5 mm long, although the loment appears to be immature because the stigma still remains on the pods. Further studies on this species are needed based on ample material.

2-2-3. **Tadehagi auriculatum** (DC.) H. Ohashi, stat. nov. (Fig. 7).

Desmodium auriculatum DC., Prodr. **2**: 326 (1825) [Type: Unknown locality but erroneously located as "Timor", with a note as "*Pteroloma auriculatum* Desv!" Unknown collector (P holo., n. v.)] & Mém. Lég.: 321 (1826).

Desmodium triquetrum subsp. *auriculatum* (DC.) Prain in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. **66**: 390 (1897); Meeuwen in

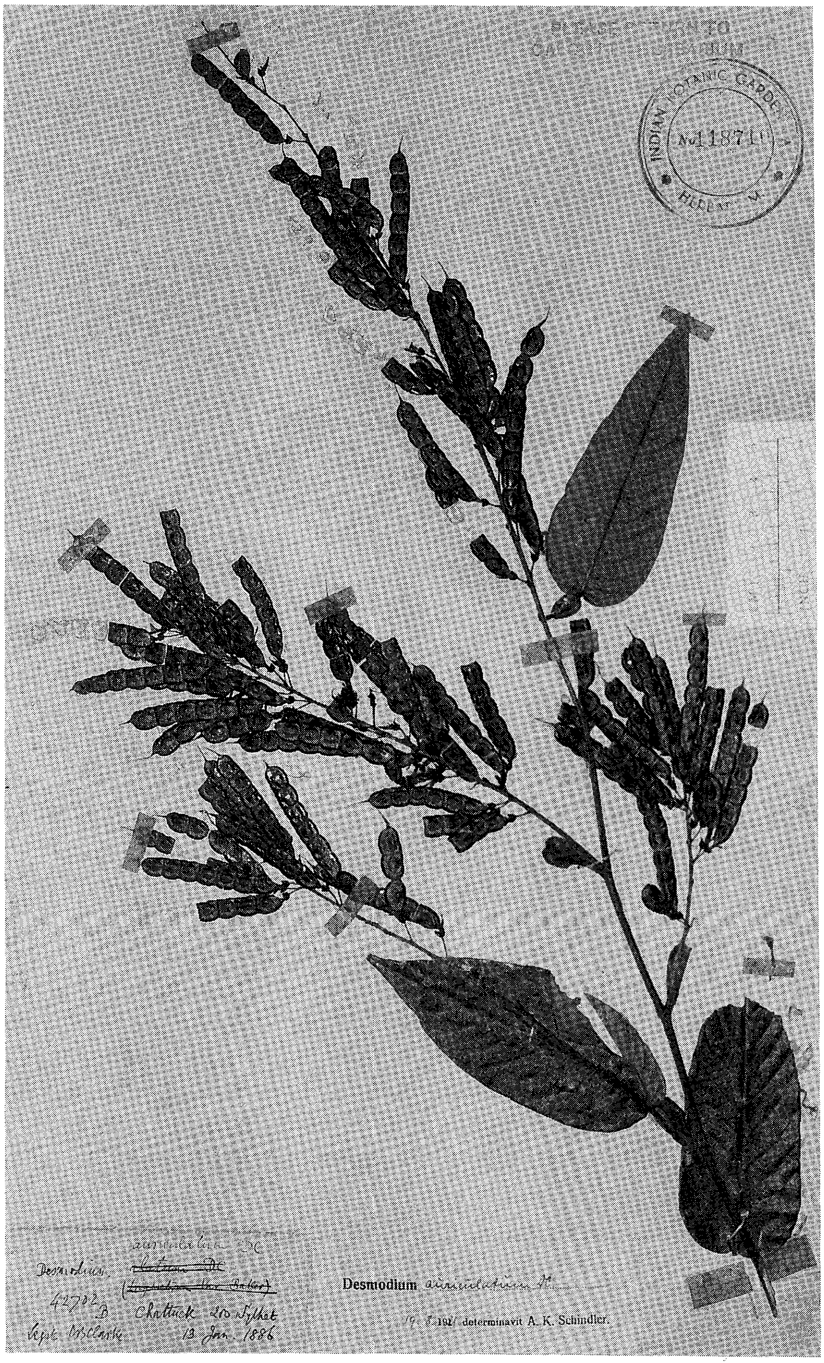

Fig. 7. *Tadehagi auriculatum* (DC.) H.Ohashi. Burma. Sylhet, Chattuck. C. B. Clarke 42702B (CAL, cited in Ohashi 1973).

Reinwardtia **6**: 263 (1962); Sanjappa, Leg. Ind. 164 (1992).

Pteroloma auriculatum (DC.) Miq., Fl. Ind. Bat. **1**(1): 258 (1855), ut "*Pteroloma auriculatum* Desv."; Schindl. in Repert. Spec. Nov. Regni Veg. **21**: 272 (1925), ut *Pteroloma auriculata* (DC.) Schindl. & in Repert. Spec. Nov. Regni Veg. Beih. **49**: 37 (1928).

Pteroloma triquetrum (L.) Desv. ex Benth. subsp. *auriculatum* (DC.) H.Ohashi in J. Jpn. Bot. **41**: 95 (1966).

Tadehagi triquetrum subsp. *auriculatum* (DC.) H.Ohashi in Ginkgoana **1**: 293, t. 41b (1973); Polhill in Fl. Mascareignes, 80. Lég.: 107, pl. 36 (1990).

Shrub. Leaves 1-foliolate. Stipules narrowly ovate, 1–1.5 cm long, 3–4 mm wide, acute, glabrous, conspicuously striate. Petioles 1–3 cm long, winged, sparsely appressed pubescent; wings 1–4 mm wide at broadest part, almost glabrous, joined to the stipel at tip; stipels curved, glabrous. Leaflet-blade narrowly ovate or ovate, 3–11 cm long, 2–4 cm wide, acute at apex, rounded to slightly cordate at base, upper surface glabrous, lower surface sparsely appressed pubescent on nerves, sparsely appressed ciliate along margin, lateral nerves alternate, 10–13 pairs, looped within margin.

Inflorescences pseudoracemose, to ca. 30 cm long, densely flowered, 2 flowers with 1–2 flower buds per node, rachis with uniformly patent minute hooked hairs. Primary bracts ovate, 6–7 mm long, ca. 3 mm wide, striate, puberulent; secondary bracts subulate, ca. 1.5 mm long. Pedicels 5–7 mm long, covered densely with patent minute hooked hairs. Bracteoles subulate, ca. 1 mm long. Calyx appressed pubescent, with minute hooked hairs, 4-lobed; lateral lobes triangular, ca. 2.5 mm long; the lowest lobe narrowly triangular, ca. 3 mm long. Standard incurved, wings 6–7 mm long, longer than the keel, long clawed (ca. 2 mm long), keel distinctly auriculate, long clawed (ca. 2 mm long). Ovary densely puberulent along both margins, minutely stipitate.

Loments (5–) 7–8-jointed, corky in pericarp, glabrescent, reticulate on lateral surfaces, with a 3–4 mm long stipe; articles almost quadrangular, 5–7 mm long, 5–7 mm wide.

Distr.: Mauritius, Seychelles, Mascarene, India (Bengal, Andaman Islands), Bangladesh, Myanmar.

Specimens examined: **Mauritius**. Sieber (L); Bourbon 576 (L). **Seychelles**. E. P. Wright s. n. (K). **India**. Roxburgh s. n. (K); Bengal. 23 Feb.1872. C. B. Clarke 16905 (K); Great Cocos Island. Prain in 1889 (L); Moolmyne. H.I 5688M (K); S. Andaman. Heinnig 590 (BO). **Bangladesh**. Sylhet, Chattuck 200. 13 Jan. 1886. C. B. Clarke 42702A (K). **Myanmar**. Tenasserium. Helfer 1648 (GH, K, L); Pegu. Scott s. n. (L).

In the original description the loments of *Desmodium auriculatum* DC. were characterized as "leguminibus glaberrimis subcoriaceis" and "Articuli leguminis 4–5 maturi facile secedentes." Also, the leaflet was "foliolis ovatis petiolo quadruplo longioribus." The type specimen was noted as originating from Timor and may bear the name "*Pteroloma auriculatum* Desv!" (Candolle 1825) or "*Heteroloma auriculatum* Desvaux" (Candolle 1826). The type is apparently different from the specimen of *Desmodium auriculatum* DC. in Candolle: Prodromi Herbarium in G (IDC micro-edition, sheet no. 381), because the specimen in G has pubescent loments bearing 2–4 remaining articles and shorter leaflet-blades. The microfiche specimen bears an label as "*Heteroloma auriculatum*. Timor. Museum de Paris 1821". I am not sure whether the label was written by Desvaux, Candolle or some other persons.

Schindler examined the original specimen on the microfiche and determined it as *Pteroloma triquetrum* in 1925. I examined a probable duplicate of *Desmodium auriculatum* of the Prodromi Herbarium in L (Fig. 8). It is referable to *Tadehagi triquetrum* subsp.

triquetrum.

The type must be in P as cited above. Schindler (1928), Meeuwen (1962) and Polhill (1990) recorded that the type is in P. As pointed out by Meeuwen (1962), the type must be erroneously located. *Tadehagi auriculatum* has so far been not known in Timor.

2-2-4. **Tadehagi robustum** Pedley in Austrobaileya **5**: 258 (1999) [Type: Western Australia. Mitchell Plateau (c. 1 km N of CRA mining camp), 14°49′S 125°40′E. 14 Jan. 1982. B. R. Maslin 5085 (PERTH holo. n. v.; K iso.)].

Description see Pedley (1999).

An isotype of this species in Kew does not have mature loments, but the loments are shortly stiped and sparsely pubescent on the lateral surfaces. The leaflet-blades of *T. robustum* were characterized as oblong or ovate and 2–2.5 times longer than wide; the pods have 4–5 articles and are sparsely pubescent on the lateral surfaces; the articles in the middle part of the loments are larger than those in *T. triquetrum*; i. e., ca. 5 mm long and 8 mm wide in *T. robustum* against 2–3.5 mm long and 4–6 mm wide in *T. triquetrum* (Pedley 1999).

Distr.: Endemic to N. Australia.

Specimens examined: **Australia**. Western Australia. Amax Crusher, Mitchell Plateau, N.W. Kimberley. K. F. Kenneally 7027 (K); B. R. Maslin 5085 (K iso.).

2-2-5. **Tadehagi triquetrum** (L.) H. Ohashi in Ginkgoana **1**: 290 (1973), p. p., excl. subspp. *alatum*, *auriculatum*, et *rodgeri*; Dy Phon in Dy Phon & al., Fl. Camb. Laos Vietn. **27**: 50 (1994), p. p., excl. subsp. *rodgeri*; Yang & Huang in Fl. Reipub. Popul. Sin. **41**: 63 (1995).

Hedysarum triquetrum L., Sp. Pl.: 746 (1753) [Type: Herb. Hermann **4**: 18, No. 286, left-hand plant (BM, n. v.). Lectotypification by Pedley in Turland and Jarvis (1997)].

Desmodium triquetrum (L.) DC., Prodr. **2**: 326 (1825); Wight & Arn., Prodr. Fl. Ind. Orient.: 224 (1834), p. p., excl. *D. alatum*; Baker in Hook.f., Fl. Brit. Ind. **2**: 224 (1876), p. p., excl. *D. alatum* et *D. auriculatum*.

Pteroloma triquetrum (L.) Desv. ex Benth. in Miq., Pl. Jungh.: 220 (1852), p. p., excl. *P. alatum*.

Distr. (sp.): Sri Lanka, India, Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Indochina, Malesia, S. & SW China, Taiwan, the Ryukyus (Is. Ishigaki, introduced), N. Australia(?), and Pacific (New Caledonia).

Wight and Arnott (1834) made the circumscription of *Desmodium triquetrum* (L.) DC. broader than that of Candolle (1825) by inclusion of *D. alatum* DC. and *D. pseudotriquetrum* DC. to its synonymy. Bentham (1852) followed the broader concept under *Pteroloma*. Baker (1876) added *D. auriculatum* DC. into *D. triquetrum* in the broader concept as a synonym. Kurz (1876), on the other hand, recognized the typical *D. triquetrum* as var. *genuinum* and *D. pseudotriquetrum* with *D. alatum* as *D. triquetrum* var. *pseudotriquetrum*. Further, Prain (1897) revised these taxa as subspecies of *D. triquetrum* and this concept for *D. triquetrum* has been accepted by Meeuwen (1962), Ohashi (1966 as *Pteroloma*, 1973 as *Tadehagi*), Sanjappa (1992) and others as cited for the corresponding subspecies in the synonymic lists in this paper, although Schindler (1924) recognized them, as in Candolle (1825), as distinct species under *Pteroloma*. The previous concepts are, however, revised in this paper as recognizing three independent species, *Tadehagi alatum*, *T. auriculatum*, and *T. triquetrum*, of which *T. triquetrum* includes two subspecies plus two hybrids.

Tadehagi triquetrum is divided into two subspecies by difference in morphology, distribution and habit. It is distributed in Asia from India, Sri Lanka through SE. Asia, China to Taiwan and New Caledonia. The distribution pattern differs between subsp. *triquetrum* and subsp. *pseudotriquetrum*; the former is not found in the Himalayas and is rare in Malesia, whilst the latter is more restricted being absent from Sri Lanka, Bangladesh, Myanmar, Thailand, Indochina, and Pacific (New Caledonia), while rare in Taiwan. Moreover, the two subspecies differ in habit: subsp. *triquetrum* is usually erect but subsp. *pseudotriquetrum* is usually prostrate to ascending.

Tadehagi triquetrum in the present circumscription shows great morphological variation in density of hairiness on loments and shape of leaflet-blades in New Guinea, the Philippines and Timor.

Degree of hair density on the lateral surface of loments varies greatly especially in New Guinea (with examples) and the Philippines from entirely glabrous (e. g., Reeder 865, Brass 24360, Henty NGF20600), sparsely pubescent (e. g., Brass 27226, Leach & Galore NGF33266, Wiakabu & A.M.C. 73580) through moderately dense pubescent (e. g., Brass 7965, Pullen 7245) to very densely hirsute (e. g., Anta 49, Anta 56, Brass 7652, Gebo UPNG312, Henty & Katik NGF38651, Pullen 6766, Saunders 47).

It has been regarded as an important diagnostic character between subsp. *triquetrum* and subsp. *pseudotriquetrum* whether hairy or glabrous on the lateral surfaces of loments. Both are, however, always densely sericeous on the sutures of loment. Candolle (1825) described the loment of *Desmodium triquetrum* as "leguminibus sessilibus hirsutis" and *D. pseudotriquetrum* as "leguminibus glabris ad suturam utramque adpresse villoso-ciliatis". The hairy loments develop from the pubescent ovary, while glabrous loments from glabrous ovary. The thinly pubescent pods are derived from pubescent pistils which become less hairy during development. The loment character is, therefore, useful for segregation two taxa within *Tadehagi triquetrum*, although the degree of hair density seems to be continous between pubescent to glabrous in New Guinea and the Philippines.

The leaflet-blade of *Tadehagi triquetrum* shows a different tendency in shape between subsp. *triquetrum* and subsp. *pseudotriquetrum* (Ohashi 1973). The blades of subsp. *triquetrum* are usually three to six times longer than broad, while those of subsp. *pseudotriquetrum* less than three times longer than broad. The blades of subsp. *triquetrum* variable especially in the Philippines, i. e., 13–18 cm long, 0.6–0.7 cm wide (20–25 times longer than broad) in Ramos & Edano Bur. Sci. 44688 (A (Fig. 9), K, NY, US), 11–19.5 cm long, 1–1.5 cm wide (11–13 times longer than broad) in Nemoto et al. 10188 (TUS), or 13–13.5 cm long, 1.2–1.5 cm wide (9–10 times longer than broad) in Ramos & Edano Bur. Sci. 39222 (A, K, L, US). A specimen from Timor, Cinatti 113 (L) is an extremely large individual having leaflet-blades 20 cm long and 6.5 cm wide, stipules to 2.5 cm long and 1 cm wide, and the inflorescence to 36 cm long (in flower), although its flowers and bracts are normal in size.

The remarkable variation in *Tadehagi triquetrum* in New Guinea, the Philippines and Timor may be derived from evolutionary events, although there remain further problems whether the variation correlates with any conditions in their habitats.

Specimens of *Tadehagi triquetrum* from the Lesser Sunda Islands are rather uniform in having leaves similar to subsp. *pseudotriquetrum*, while their loments are pubescent on the lateral surfaces as in subsp. *triquetrum*. An example for such specimens is the so-called isotype of *Desmodium auriculatum* DC. from Timor (L) (Fig. 8). I determined it *Tadehagi triquetrum* subsp. *triquetrum* in 1999. This form is similar to a hybrid between subsp. *triquetrum* and subsp. *pseudotriquetrum* that will be discussed later, but I postpone decision on the hybrid-

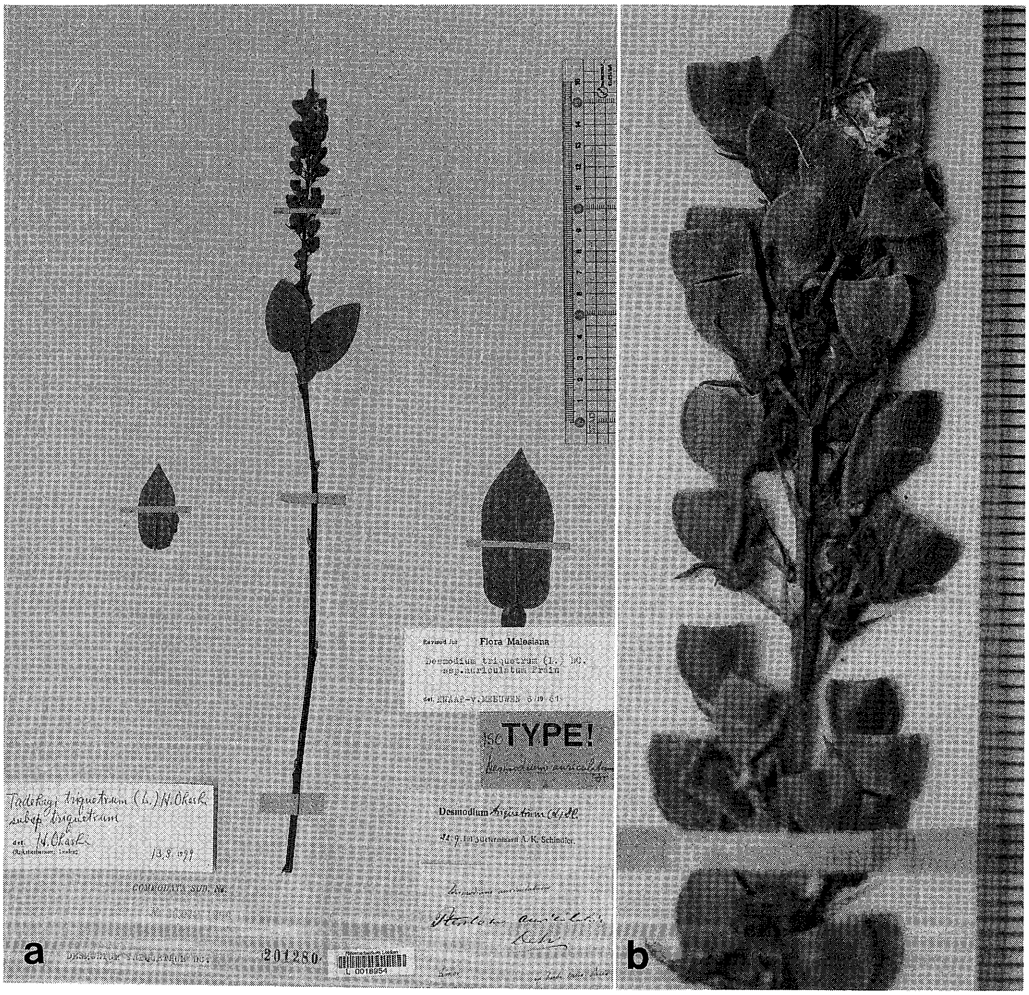

Fig. 8. *Tadehagi triquetrum* (L.) H.Ohashi subsp. *triquetrum*. a: So-called isotype of *Desmodium auriculatum* DC. Timor. Unknown collector (L). b: Infructescence enlarged from fig. a.

ism for the specimens from the Lesser Sunda Islands cited in this paper. Further study is needed on the basis of ample material.

Key to the subspecies of *Tadehagi triquetrum*:

1. Loments glabrous on lateral surfaces; leaflet-blade less than 3 times longer than broad, usually ovate or narrowly ovate..... ....subsp. *pseudotriquetrum*
1. Loments densely to sparsely pubescent on lateral surfaces; leaflet-blade usually more than 3 times longer than broad, linear to narrowly oblong-ovate or narrowly ovate ....subsp. *triquetrum*

2-2-5-1. subsp. **triquetrum**: H.Ohashi in Ginkgoana **1**: 296, pl. 42a, figs. 81, 82, 85 (1973); Dy Phon in Dy Phon & al., Fl. Camb. Laos Vietn. **27**: 50, pl. 11:4–5 (1994).

Hedysarum alatum Roxb., [Hort. Beng. 56 (1814), nom. nud.] Fl. Ind. ed. 2, **3**: 348

(1832) (fide Prain 1897).

Desmodium acrocarpum Hance in J. Bot. **7**: 473 (1848) [Type: Ins. Hong-Kong Chinensium. Hance?, Herb. unknown].

Desmodium triquetrum (L.) DC. var. *genuinum* Kurz in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. **45**: 232 (1877).

Desmodium triquetrum (L.) DC. subsp. *genuina* Prain in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. **66**: 390 (1897).

Pteroloma triquetrum (L.) Desv. ex Benth. s. s.: Schindl. in Repert. Sp. Nov. **20**: 271 (1924).

Desmodium triquetrum (L.) DC. subsp. *triquetrum*: Meeuwen in Reinwardtia **6**: 262 (1962); Verdc., Man. New Guinea Leg.: 410 (1979); Sanjappa, Leg. Ind. 164 (1992).

Distr. (subsp. *triquetrum*): Sri Lanka, India, Bangladesh, Myanmar, Thailand, Indochina, Malesia, S & SW China, Taiwan (new record, rare), Ryukyu (Is. Ishigaki, introduced), N. Australia(?), and Pacific (New Caledonia).

Specimens examined from Japan, Taiwan, and Malesia (excl. other regions): **Japan**. Ryukyu, Is. Ishigaki, Hirakubo. In a stock farm. 8 May 1954. T. Amano 7352 (RYU). **Taiwan** (new record). Ilan: Yuan-shan, 2.5 km SW of I-lan City, 24°45′–121°43′. A small hill of about 40 m high. C. C. Hsu 8382 (TAI, TUS). **Lesser Sunda Is**. Flores. Kooy 117b (L); Schmutz 237 (L); Schouten 99 (L); Verheijen 398 (L), Verheijen 399 (L), Verheijen 4417 (L); Timor. Unknown collector (L, G-DC as *Desmodium auriculatum* DC. in Candolle: Prodromi Herbarium, IDC micro-edition sheet no. 381), Bloembergen 3366 (K, L), Walsh 17 (A, BO), Cinatti 113 (L), Friedberg 195 (L), Wiriadinata 2969 (L); Bessilau. Steenis 18593 (L); Wetar. Steenis 3610 (K), Elbert 4372 (L), Elbert 4483 (L). **New Guinea**. Road to biv. Mok. forest. Anta 49 (L); Road to Kp. Kakajan. Anta 56 (K, L); Papua. Milne Bay District. Brass 24360 (A, K, L, US); Lake Daviumbu, Middle Fly River. Brass 7652 (A, L); Middle Fly River. Brass 7965 (A, K, L); Hombrum Bluff. Gebo UPNG 312 (L); Arufi. Henty & Katik NGF38651 (L); Tufi, alt. 120 m. Leach & Galore NGF33266 (L); Goragatabu Creek area. Pullen 6766 (A, K, L); ca. 3 miles S. of Morehead Patrol Post. Pullen 7245 (A, K, L); ca. 0.5 mile from Kasiawa on Bekalana track. Tufi Subdistrict. alt. ca. 200 ft. Saunders 47 (K, L); Beside the Haus Tambaran. Wiakabu & A.M.C. 73580 (A, K, L). **Philippines**. Luzon. Ramos & Edano Bur. Sci. 44688 (A, K, NY, US); Mindanao. Ramos & Edano Bur. Sci. 39222 (A, K, L, US); Culion. Merrill 519 (GH, NY, US); Zambales Prov., Masinloc Town, Coto, S. side of Sul Lauis River, above Coto Mines. 15°35′N, 120°05′E., alt. 15–170 m. T. Nemoto & al. 10188 (TUS).

Records of distribution of this subspecies from Australia (cf. Meeuwen 1962, Ohashi 1973) may be doubtful (Pedley 1999).

2-2-5-2. **Tadehagi triquetrum** (L.) H. Ohashi subsp. **pseudotriquetrum** (DC.) H.Ohashi in Ginkgoana **1**: 295, t. 42b (1973); Huang & H.Ohashi in Li & al., Fl. Taiwan **3**: 389, t. 650 (1977); H.Ohashi & al. in Sci. Rep. Tohoku Univ. ser. 4, **38**: 329 (1984) & **39**: 239 (1988); Huang & H.Ohashi in Huang & al., Fl. Taiwan ed. 2, **3**: 369, t. 192 (1993).

Desmodium pseudotriquetrum DC. in Ann. Sci. Nat. Paris **4**: 100 (1825) [Type: Nepal. Wallich (G holo., n. v., A iso. p. p.)] & Mém. Lég.: 320 (1826); Merr. in Philipp. J. Sci., C. **5**: 87 (1910) & in Trans. Amer. Phil. Soc. **24**: 201 (1935).

Desmodium triquetrum (L.) DC. var. *pseudotriquetrum* (DC.) Kurz in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. **45**: 232 (1877).

Desmodium triquetrum subsp. *pseudotriquetrum* (DC.) Prain in J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. **66**: 390 (1897); Meeuwen in Reinwardtia **6**: 263 (1962); Verdc., Man. New Guinea Leg.: 410 (1979); Grierson & Long, Fl. Bhutan **1**(3): 669 (1987); Sanjappa, Leg. Ind. 164 (1992).

Pteroloma pseudotriquetrum (DC.) Schindl. in Repert. Sp. Nov. **20**: 272 (1924).

Tadehagi pseudotriquetrum (DC.) H. Ohashi in J. Jpn. Bot. **70**: 116 (1995); Yang & Huang in Fl. Reipub. Popul. Sin. **41**: 65 (1995).

Distr. (subsp. *pseudotriquetrum*): India, Nepal, Bhutan, Malesia (rare in New Guinea and Philippines), S & SW China, and Taiwan.

Specimens examined (addition to Ohashi 1973):

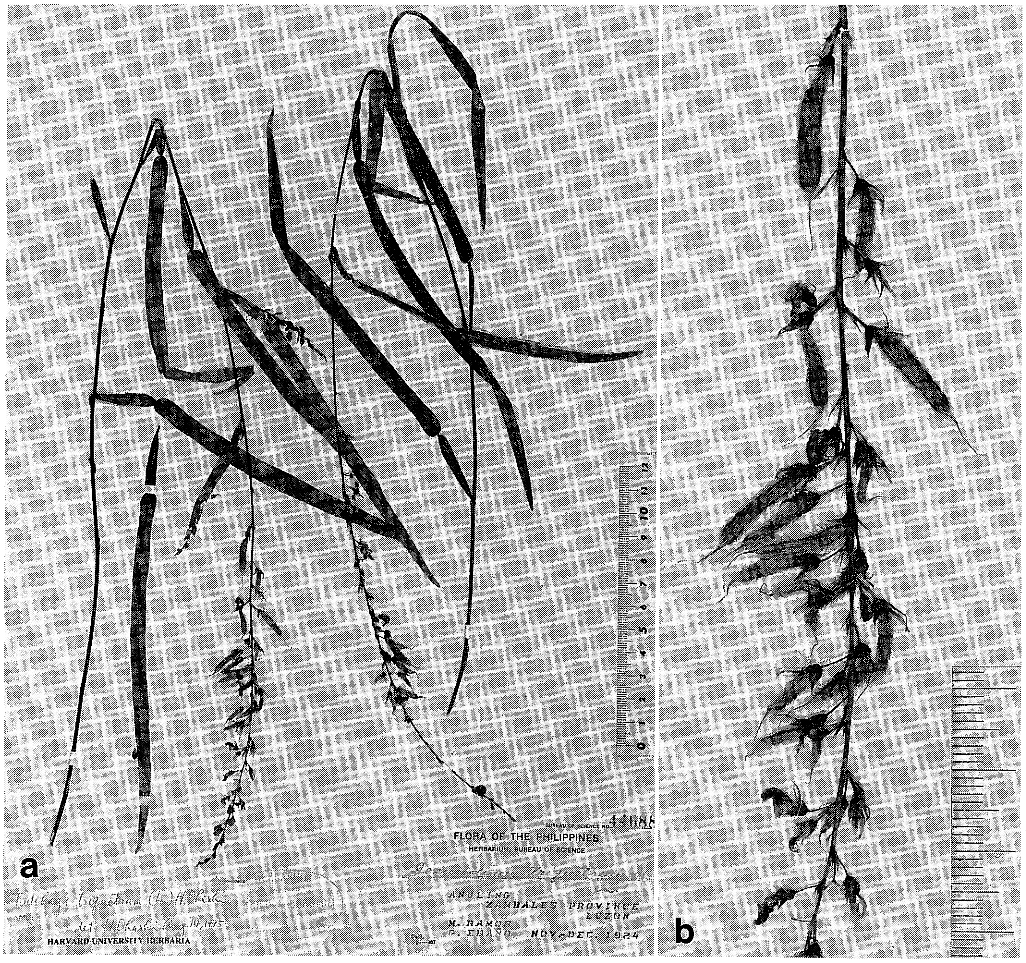

Fig. 9. *Tadehagi triquetrum* (L.) H.Ohashi subsp. *triquetrum* (DC.) H.Ohashi. a: Philippines. Luzon. Ramos & Edano Bur. Sci. 44688 (A). b: Young infructescence enlarged from fig. a, showing densely pilose loments.

India. Assam. Chand 3604 (L), Chand 8253 (L), Koelz 24228 (L), Koelz 28746 (L), Masters s. n. (L); Bengal. Biswas 6480 (A); Darjeeling. Cave 11 (GH); Kumaon. Strachey & Winterbottom s. n. (GH); Manipur. Bullock 637 (K); Mussoorie. Stewart 16120 (A). **Myanmar**. Rangoon. Dickason 5087 (A); Namti River Valley, Vicinity of Myitkyina. R.O. Belsher 623 (K); Camp Landies area, Myitkyina region. R.O. Belsher 730 (K). **New Guinea**. Dobodura-Buna area. Reeder 865 (A, US); Milne Bay District. Brass 24360 (K, L, US); Onasinkian. Henty NGF20600 (L). **Philippines**. Luzon. Lepanto. Merrill 4477 (K, NY, US); Luzon. Williams collector 1414 (GH, K, NY, US).

The typical form of subsp. *pseudotriquetrum* (the type from Nepal) has ovate to narrowly ovate leaflet-blades. It is common in the Himalayas, China and Taiwan, but rare in New Guinea and the Philippines. One specimen, Williams' collector 1414 (GH, NY), is the typical form from the Philippines (Fig. 10).

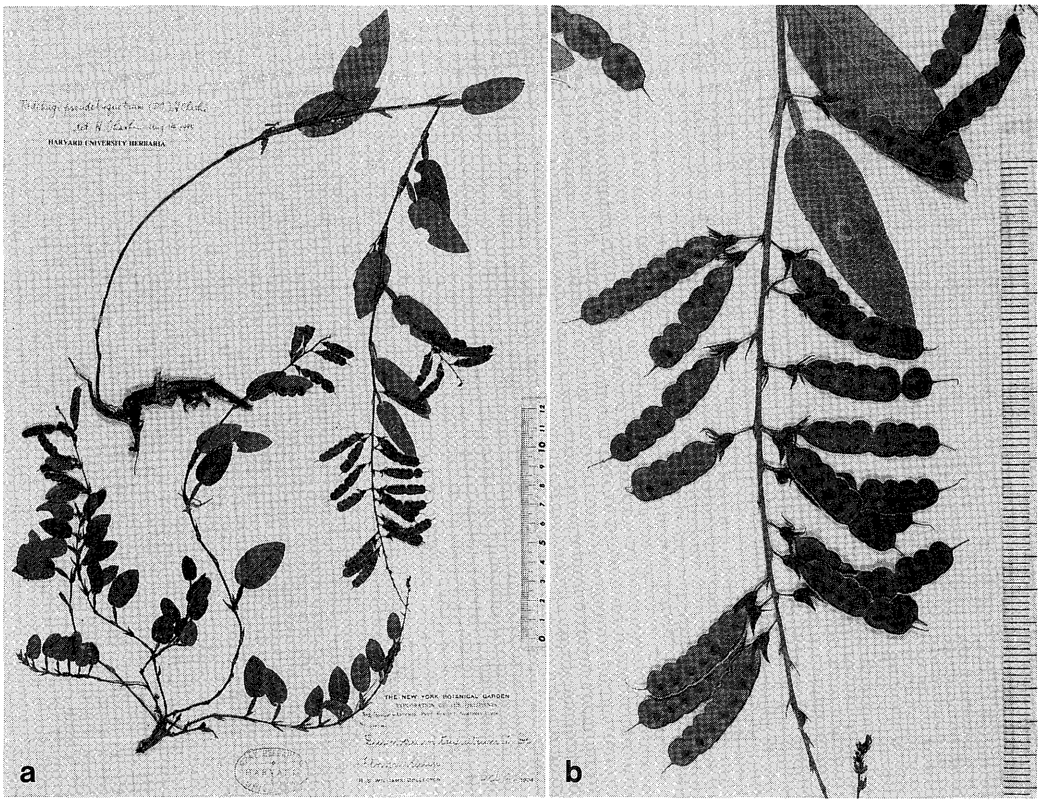

Fig. 10. *Tadehagi triquetrum* (L.) H.Ohashi subsp. *pseudotriquetrum* (DC.) H.Ohashi. a: Philippines. Luzon. Williams collector 1414 (GH). b: Infructescence enlarged from fig. a, showing glabrous loments on lateral surfaces.

2-2-5-3. Presumable intraspecific hybrids in *Tadehagi triquetrum*.

Intraspecific hybrids are recorded only in *Desmodium* and *Tadehagi* in the subtribe Desmodiinae. Schindler (1924) recognized a hybrid in *Tadehagi* (as *Pteroloma*) for the first time as "*Pteroloma pseudotriquetrum* × ?*triquetrum*" based on a specimen from the Philippines, Ramos Bur. Sci. 1036. He considered that the loments and calyx of the specimen are similar to *P. pseudotriquetrum*, but the leaves are similar to *P. triquetrum* (erroneously as *P. alatum*). I examined a duplicate of this specimen in GH in which the leaves of the specimen are similar to *Tadehagi triquetrum* subsp. *triquetrum*, but the pods are referable to *T. triquetrum* subsp. *pseudotriquetrum* because they are glabrous on the lateral surfaces and appressed hairy on the margins (Fig. 11). A similar specimen, also from the Philippines, Ramos & Edano Bur. Sci. 29494 (K), was determined by Schindler on 28 Feb. 1926 as "*Pteroloma pseudotriquetrum* × ?*alatum* or ?*triquetrum*" with the note "legumina sterilia. *Pt. alatum* in insulis Philippine non reperitier" (Fig. 12). However, the loments on this specimen are immature and I cannot be certain whether they would have produced seeds or not. The shape of leaflet-blade is similar to typical subsp. *triquetrum*, i. e., narrowly oblong or narrowly ovate (9–10 cm long, 1.2–2 cm

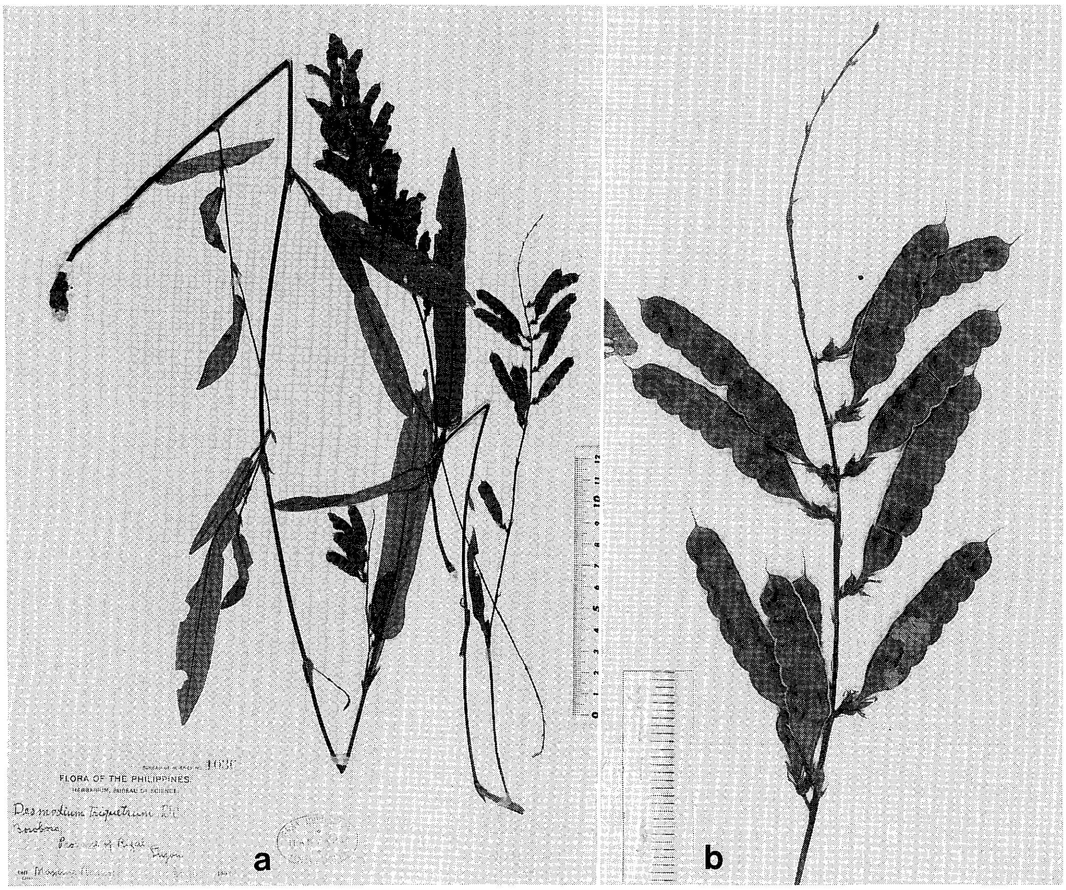

Fig. 11. *Tadehagi triquetrum* (L.) H.Ohashi nothosubsp. *philippinensis* H.Ohashi. a: Philippines. Luzon. Prov. Rizal, Bosoboso. July 1906. M. Ramos Bur. Sci. no. 1036 (GH–holotype). A duplicate of voucher specimen of *Pteroloma pseudotriquetrum* × ?*triquetrum* determined by Schindler. b: Infructescence with loments glabrous on lateral surfaces, enlarged from fig. a.

wide), and the loments are glabrous on lateral surfaces.

The following specimens are also intermediate between subsp. *triquetrum* and subsp. *pseudotriquetrum*: Ramos Bur. Sci. 22685 (GH) has filiform leaves (13 cm long, 1.5 cm wide; ca. 8 times longer than broad) and loments glabrous on the lateral surfaces; Vidal 2610 (A) has also leaflets similar to subsp. *triquetrum*, but pods are similar to subsp. *pseudotriquetrum*, and Edano PNH 14138 (A, L) has loments as subsp. *pseudotriquetrum*, but leaflet-blade as subsp. triquetrum (Fig. 13). The specimen, Brass 27226 (K) from New Guinea, has ovate leaflet-blades (2.2–4.7 cm long, 1.1–1.8 cm wide; less than 3 times longer than broad), which is similar to those of subsp. *pseudotriquetrum*, while its pods is sparsely pubescent on the lateral surfaces.

I regard these intermediate forms as hybrids between *Tadehagi triquetrum* subsp. *triquetrum* and subsp. *pseudotriquetrum*, as they occurs only in the Philippines and New Guinea where both subspecies are known. Some problems regarding possible hybrids

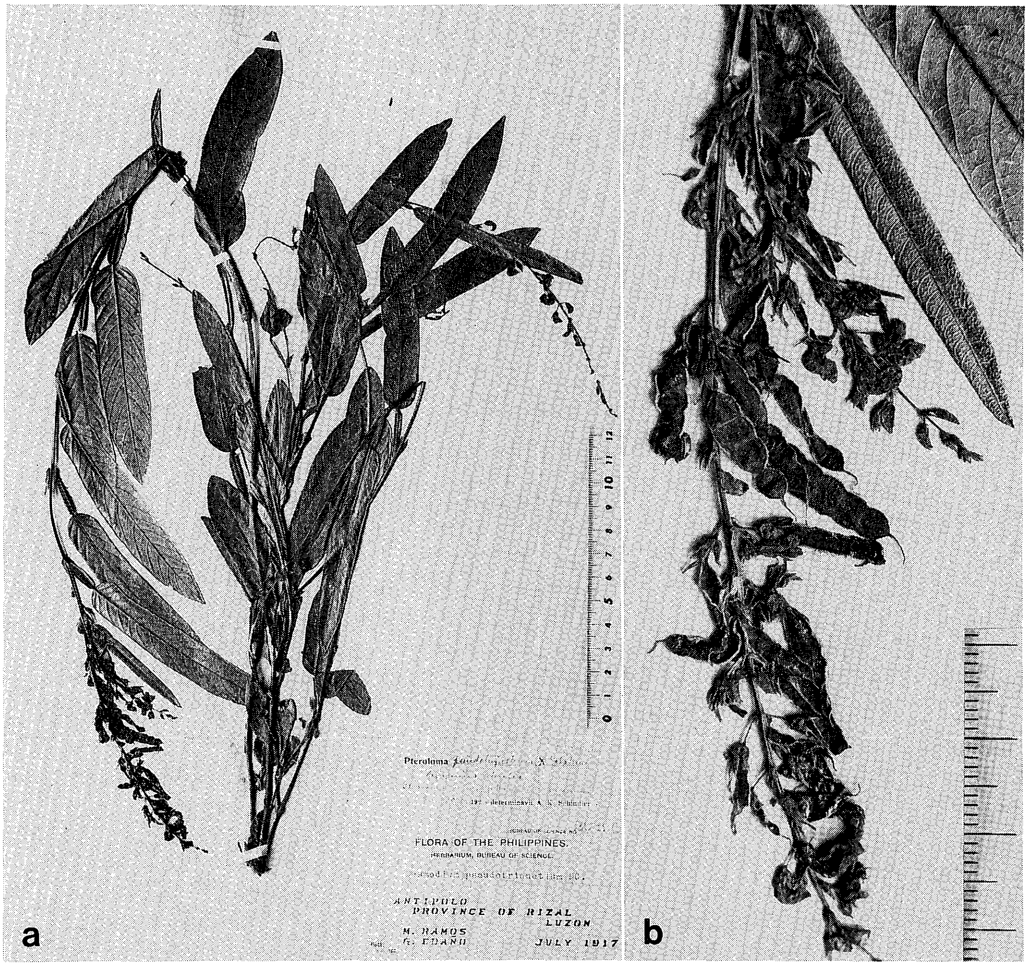

Fig. 12. *Tadehagi triquetrum* (L.) H.Ohashi nothosubsp. *philippinensis* H.Ohashi. a: Philippines. Luzon. Rizal. Ramos & Edano Bur. Sci.29494 (K). A voucher specimen determined by Schindler as "*Pteroloma pseudotriquetrum* × ?*alatum* or ?*triquetrum*". b: Young infructescence with loments glabrous on lateral surfaces, enlarged from fig. a.

remain in specimens from the Lesser Sunda Islands in this species.

Tadehagi triquetrum (L.) H.Ohashi nothosubsp. **philippinensis** H.Ohashi, hybr. nov. (Fig. 12)

Pteroloma pseudotriquetrum × ?*triquetrum*: Schindl. in Repert. Sp. Nov. **20**: 273 (1924).

Tadehagi triquetrum subsp. *triquetrum* × subsp. *pseudotriquetrum* (DC.) H.Ohashi.

Tadehagi triquetrum inter subsp. *triquetrum* et subsp. *pseudotriquetrum* quasi intermedia et verisimiliter ex hybridatione harum specierum orta, ab ambobus fructibus abortivis differt, quoad formam foliorum cum subsp. *triquetro* sat congruens sed leguminibus lateralibus glabris.

Specimens examined: **Philippines**. Luzon. Prov. Rizal, Bosoboso. July 1906. Ramos Bur. Sci. no. 1036 (GH–holotype, NY, US); Prov. Rizal. Ramos Bur. Sci. 22685 (GH); Rizal. Ramos & Edano Bur. Sci. 29494

(K, US); Manila. Vidal 2610 (A, K).

The type, *Ramos Bur. Sci. 1036* (GH), was determined by Schindler (1924) as "*Pteroloma pseudotriquetrum* × ?*triquetrum*". He considered that the pods and calyx are similar to *P. pseudotriquetrum*, but the leaves are similar to *P. triquetrum* (erroneously as *P. alatum*). Also, I confirmed that the leaves of the specimen are similar to *Tadehagi triquetrum* subsp. *triquetrum*, but the pods

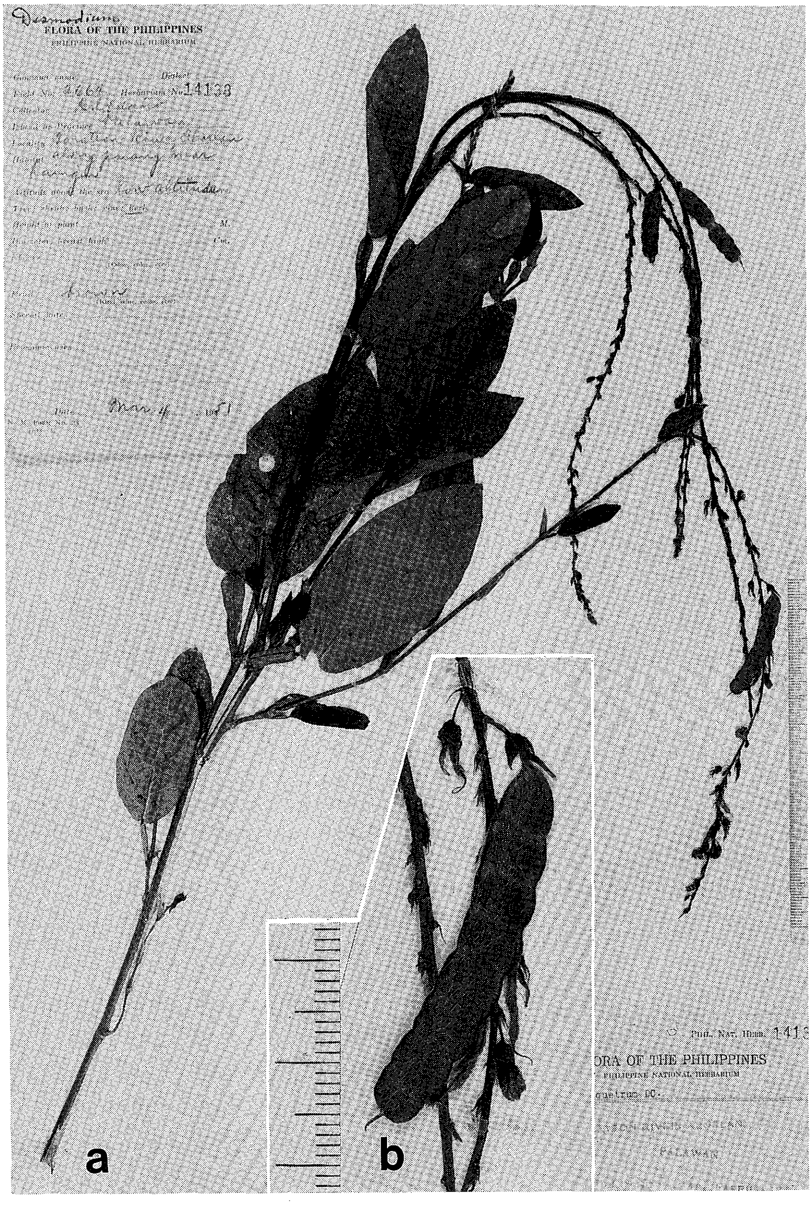

Fig. 13. *Tadehagi triquetrum* nothosubsp. *philippinensis* var. *palawanensis* H.Ohashi. a: Philippines. Palawan: Edano, 4 Mar. 1951. PNH14138 (A–holotype). b: A loment thinly pubescent on lateral surfaces, enlarged from fig. a.

are referable to *T. triquetrum* subsp. *pseudotriquetrum* because they are glabrous on the lateral surfaces and appressed hairy on the margins. Another specimen, Vidal 2610 (A), also has leaves similar to *triquetrum*, but pods are similar to *pseudotriquetrum*.

Two forms are recognized in the hybrid:

i. Loments densely to sparsely pubescent on lateral surfaces (as subsp. *triquetrum*), leaflet-blade less than 3 times longer than broad, usually ovate or narrowly ovate (as subsp. *pseudotriquetrum*) .... var. *philippinensis*

i. Loments glabrous on lateral surfaces (as subsp. *pseudotriquetrum*); leaflet-blade usually more than 3 times longer than broad, linear to narrowly oblong-ovate or narrowly ovate (as subsp. *triquetrum*) .... var. *palawanensis*

2-2-5-i: *Tadehagi triquetrum* nothosubsp. *philippinensis* H.Ohashi var. **philippinensis**.

2-2-5-ii: *Tadehagi triquetrum* nothosubsp. *philippinensis* H.Ohashi var. **palawanensis** H.Ohashi, var. nov. (Fig. 13)

Hybrida e *Tadehage triquetro* subsp. *triquetro* et subsp. *pseudotriquetro* exorta, sed varietas haec ab var. *philippinensi* differt foliis subsp. *pseudotriquetri* et leguminibus subsp. *triquetri*.

Specimens examined: **Philippines**. Palawan: Edano 4 Mar. 1951. PNH14138 (A–holotype, L). **New Guinea**. Fergusson Is. Brass 27226 (A, K, L, US).

I thank Dr. Bin Ye of the Tohoku University for providing unpublished results of pollen morphology and Dr. Tadashi Kajita of The University of Tokyo also for providing unpublished molecular data. I wish to express my sincere thanks to the curators of A & GH, BKF, BO, CAL, K, KYO, L, LAE, NY, PNH, TI, and US for allowing me to work in their herbaria and/or for loaning to me their specimens. Also, I thank Mr. Gregory Kenicer of The University of Tokyo for his reading the manuscript.

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大橋広好：マメ科タデハギ属の再検討と新属 *Akschindlium* の設立

1973年にアジアのヌスビトハギ属とその近縁属を分類し，*Pteroloma* 属に *Droogmansia* 属の1種 *Droogmansia godefroyana* (Kuntze) Schindl. を加えて独立属とし，タデハギ属 *Tadehagi* H.Ohashi と命名した．その後も新たな資料を加えてタデハギ属について検討を続けた結果，本論文では *Droogmansia godefroyana* を *Akschindlium* H.Ohashi として独立属とするとともに，タデハギ属を再構成した．*Akschindlium* はタイとインドシナに分布する1種よりなる．この属名はヌスビトハギ連の分類に大きな貢献をしたドイツ人 Anton K. Schindler 博士（1879–1964）を記念した．タデハギ属，*Akschindlium* および *Droogmansia* の区別点は本文に示した．タデハギ属としては *Tadehagi alatum* (DC.) H.Ohashi, *T. andamanicum* (Balakr. & N.G.Nair) S.P.Mathew, *T. auriculatum* (DC.) H.Ohashi, T. *robustum* Pedley, *T. rodgeri* (Schindl.) H.Ohashi およびタデハギ *T. triquetrum* (L.) H.Ohashi の6種を独立種と認めた．これまで多くの地域のタデハギを調べてきたが，この種はフィリピン，小スンダ列島およびニューギニアにおいて小葉の形と果実の毛の密度で特に著しい変異を示すことが明らかになった．しかし，果実側面が無毛の subsp. *pseudotriquetrum* (DC.) H.Ohashi は葉身の形，生育形および分布のパターンがタデハギと異なるので，亜種として区別した．また，フィリピンから記録されていた雑種 *Pteroloma pseudotriquetrum* × ?*triquetrum*: Schindl. をタデハギと subsp. *pseudotriquetrum* の雑種と認め，nothosubsp. *philippinensis* H.Ohashi と命名し，var. *palawanensis* H.Ohashi を区別した．なお台湾にも亜種タデハギがあることを記録した．

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